Engineering Library

AMERICAN ARTISAN and Hardware Record

Vol. 79. No. 17. 620 SOUTH MICHIGAN AVENUE, CHICAGO, APRIL 24, 1920. $2.00 Per Year.

THIS IS THE JOINT

WITH ITS TIGHT, SNAP FIT, THAT HELPS

HANDY DOUBLE WALLED FURNACE PIPE

TO PRODUCE BIG RESULTS

Big Results—from the workmen who will yield a maximum of **ACCOMPLISHMENT** (not mere labor) for every hour they are on the job—and that is what you must get in these days of short hours and high wages.

Big Results—ever afterward for the owners by delivering a maximum of heat INTO THE ROOMS from all the fuel used and allowing practically none to escape and be wasted in the partitions.

IF YOU CAN USE PIPE THAT SHOWS YOU BIGGER PROFITS, AND THAT INSURES MORE THAN MERELY "SATISFIED" CUSTOMERS—ISN'T THAT THE PIPE FOR YOU TO USE? ESPECIALLY IF IT'S "HANDY"?

F. MEYER & BRO. CO.

PEORIA, ILLINOIS

Published Weekly. *Entered as Second-Class Matter June 25 1885 at the Post Office at Chicago Illinois under Act of March 3rd 1879*

ALPHABETICAL INDEX AND CLASSIFIED LIST OF ADVERTISERS, Pages 74 and 75

D. D.
High Closet
Reservoir

It Pays to Sell a Good Range

ROESCH'S La-Roes-Ko represents the best that can be produced in the Art of Stove Making. Superior in QUALITY and WORKMANSHIP. STRONG, DURABLE, SANITARY and BEAUTIFUL. All enameled range—enameled inside and outside—non-corrosive.

The agency for ROESCH'S up-to-the-minute line of Enameled Stoves and Ranges is worthy of your consideration.

Catalogue and Discount on request

WE MAKE ENAMEL STOVES AND RANGES ONLY

ROESCH ENAMEL RANGE CO.

BELLEVILLE, ILLINOIS

MAHONING HEATERS

Sell Themselves

So many superior qualities are involved in **MAHONING** construction that to tell of one would slight others equally as important.

No need to ***talk*** Mahoning qualities. ***Show*** your customer,—he will see it at a glance.

We want good live dealers everywhere, and offer a tempting proposition.

A style and size for every purpose.

MAHONING TYPE "C"

Illustration shows quite clearly the combustion as it takes place in the Mahoning system. Note how the admission of air through the slots in the firepot causes combustion to take place all around the outside of the fire. The hottest part of the flame is in direct contact with the outside surface of the heater where the radiation of heat takes place. Only one of the features that have made the Mahoning famous from coast to coast.

The MAHONING FOUNDRY CO.

YOUNGSTOWN, OHIO

A Mammoth Plant With a Mammoth Production

ESTABLISHED 1880
Representative of
The Hardware, Stove, Sheet Metal, and Warm Air Heating and Ventilating Interests
PUBLISHED EVERY SATURDAY

AMERICAN ARTISAN and Hardware Record

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Interior Display.

HOW MANY DOZENS of aluminum percolators or refrigerators a hardware dealer would be able to sell by telling the people that he had a stock of them in a vault a thousand feet underground is something the shrewdest son of the seventh son could never guess. In other words, to sell commodities it is not enough to describe them, to explain their qualities, and assure the prospective customer that they are just the things which he needs. They must be displayed as well as described. It can not too often be said that the most important of the senses, in so far as merchandise is concerned, is the sense of sight. Seeing is believing. Almost it might be said that seeing is buying. Therefore, too much emphasis can not be placed upon the importance of keeping one's goods constantly before the public eye. This means getting 100 per cent value out of the window display space of the store. It means also using the right kind of interior display. That is to say, the goods ought so to be arranged in the show cases and wall cases that they are easily brought within the range of vision of people who visit the store. This can be done without any radical change in separating samples from supplies.

Much can be learned along this line from the system employed in the hardware sections of the big department stores. Practically none of their stock is hidden away. All of it is displayed in such a manner as to render it easy of inspection by the eye. In some cases it would pay the hardware retailer completely to remodel his store arrangement, even at the cost of new fixtures if it is not so designed as to permit of gainful interior display. Goods tied up in bundles or covered up in boxes on shelves bring no profits. An objection is often raised that by taking tools and articles of steel out of their tissue paper wrappings exposes them to rust from the moisture in the air. Therefore, they deteriorate in selling value.

This objection can be overcome very easily by using a transparent rustproof coating over the exposed steel parts when removing the articles from their containers for the purpose of displaying them in the window or inside the store. There are many good formulas for this purpose and the ingredients are inexpensive. A practical rust-proof coating of steel is made by dissolving one part of caoutchouc and sixteen parts of turpentine with a low temperature. Then add eight parts of boiled oil. Mix them by bringing them to the boiling point. Apply to the steel with a brush just as you would in varnishing. The coating may be removed with turpentine. By the use of this or similar coating the chief objection to displaying articles of steel is overcome. Keep your goods before the people. After a while, when you shall have thoroughly established the system of continuous display, you will not run much risk from loss by rust because the articles will move into the hands of customers faster than rust can form.

Wasteful Taxation.

PUBLIC OPINION IS the power which drives the engine of government. Just now the people of this country are beginning to question the wisdom, justice, and adequacy of the system of federal taxation which we have inherited from the war period. It is essential to the devising of remedial legislation that public opinion be formed upon a right understanding of the defects of the prevailing revenue measures. Therefore, it is a timely thing to set before our readers a digest of the objections to the system of taxation now in force.

The first objection to it is that the bulk of government revenue is based upon profits or income which, with the first setback in the business affairs of the people, will very largely disappear. It treats all but the most moderate incomes as something to be heavily taxed. Thus it prevents the accumulation of savings which would be used in further expansion of productive enterprises which, by increased output, would tend to lower costs to consumers.

Another objection is that the present system of taxation is wasteful. It is complicated and expensive to collect—expensive alike to the Government and to the taxpayer. It withdraws from productive employment tens of thousands of clerks and accountants at a cost of millions of dollars. Moreover, it encourages waste and extravagance in business operations, leads to the paying of large salaries, employment of unnecessary people and wasteful methods—all of which increases costs. It follows down and lodges finally in the price of articles and services and, hence, must ultimately be paid by the consumer.

An illustration will make this clear. Suppose a manufacturer of some necessary article has been accustomed to make a profit of a hundred thousand dollars a year. He suddenly finds that he is to be taxed thirty-five thousand dollars on that profit; and he does not want to make any less net income and as he can not escape paying the tax he strives to secure a larger profit than before. In other words, he must make a profit of $1.60 or more where he was making $1.00, so that he may meet the accumulating sur-

taxes on the larger amount and still at least secure his former profit. He does this and passes the article with the price so loaded on to the wholesaler or jobber who, facing the same situation, meets it the same way, and the experience is repeated when the article reaches the retailer, so that by the time the article reaches the retail counter it has been loaded three times to meet the taxes of the three classes of traders.

But, it may be argued, competition should correct this condition of affairs. If another manufacturer competing with the one mentioned above should be accustomed to making only fifty thousand dollars a year, he would not have to add so much for taxes and could undersell the first man. Competition, however, is practically out of effect just now. The smaller manufacturer, finding that he can get the price set by the big man, does so and obtains that much additional profit. Thus it comes to pass that the customer has to pay an amount much greater than the actual total of the tax received by the government, and it takes it from the consumer just as surely as if it was tax levied direct upon consumption.

A reasonable alternative to the present federal system would be a tax on sales. This would be a tax upon spending rather than upon saving. A tax of this sort would be simple, easily determined and easily and cheaply collected. Its burden would be distributed with fairness and equality over all classes of people. For the sake of illustration, suppose a tax of one per cent on sales. The manufacturer sells to the wholesaler $100 worth of goods plus $1.00 tax, the total amount of the bill being $101.00; the wholesaler would follow the same method in selling to the retailer, adding the tax to the foot of the bill. The retailer, not desiring to collect a specific tax on each sale, would estimate in advance the approximate amount of his tax based on the volume of his business and treat same as an expense, such as rent or advertising, and add the fraction which it represented to the cost of the article. In either instance the consumer would pay the tax. In the first instance he would pay an inflated amount built up to meet a rising scale of tax, and in the second instance only the amount of the tax itself.

This method has other reasons to commend it to public approval. The debt of back taxes hanging over the people and the borrowing by the Government in anticipation might easily be disposed of by making the tax payable monthly. It would be a very simple matter for any individual or business house to report net sales for a month and pay one per cent upon the same, say, within the first fifteen days of the following month. No elaborate clerical work is involved either upon the part of the individual or the Government in collecting such a tax; and the tax is based upon something more substantial than profits, for while sales will shrink with a change in conditions they can not shrink to any extent comparable with the shrinkage which will take place in profits.

In considering a tax upon sales, however, we must not confuse it with the present luxury tax wherein a direct percentage is added to the cost of certain articles and collected from the consumer in that form at the retail counter. Such taxes should be abolished. They should never have been imposed. The tax on sales would be a tax on the sales as recorded on the books of any concern, large or small, and the illustration given shows how this would be added as a direct percentage in billing by manufacturers or wholesalers and estimated as an item of expense in fixing retail prices, where already the custom is to assemble items of expense and represent them by a certain definite percentage which is added to the cost of the article itself to cover all the expense of distribution at retail.

Economical Advertising.

IF THERE WERE only ten tinsmiths in a town of fifty thousand people, it would certainly be a waste of time and money to hire a messenger to call at every house and store in the town until he found the ten tinsmiths and delivered a message to them. A more economical method would be to know in advance where to find them and then go to the shortest route. This is precisely what AMERICAN ARTISAN AND HARDWARE RECORD does for its advertisers. It carries their message straight to the dealer or contractor without waste of time or money, because its readers are exactly the people whom the advertiser wants to reach.

Lessening Mail Delay.

FROM PRACTICALLY EVERY quarter of the business world come complaints about inefficient postal service While we are waiting for some radical change to bring about the necessary improvements, it would be well to give our active support to a movement which was recently started by business houses in New York City. According to a newspaper report, as a measure toward reducing postal delays the Merchants' Association at the request of Postmaster Thomas G. Patton has undertaken to induce the New York business community to do its mailing early. The present practice, not only in New York, but throughout the country is to make mailing the last act of the business day. Eighty per cent of New York's tremendous volume of mail, an average of 4,000,000 pieces, is deposited between five and seven-thirty o'clock in the evening The consequence, according to a statement by the Association, is that the postoffice is overwhelmed and delays result.

The Association proposes that business executives order letters deposited for transmission as soon as signed. This, the Association admits, will entail some small inconvenience at first. It would require the man in charge of the correspondence of a business house to sign letters as soon as written, but the saving in time would be well worth the trouble. The fact that many business men wait until the last minute to sign their letters is largely a matter of habit. It is just as easy to have mail signed and on its way by ten o'clock or two o'clock or four o'clock as an hour or several hours later in the day. We have to use the postal system which we now have. Until such a time

as it can be improved, it is wise to do our utmost to expedite the transmission of mail.

RANDOM NOTES AND SKETCHES.

By Sidney Arnold.

There is so much variance of creed from the theologic point of view that it is unwise to present a standard of belief for general acceptance. But I feel no hesitancy in offering the following code of business ethics drawn up by G. E. Whitehouse. I feel sure that it will meet everyone's approval:

I will profit by the experience of others and will not wait to learn sense by my own experience.

I will be teachable. From every human being I encounter I will learn something.

I will decide by my intellect what my tastes ought to be and make myself like the right things. I will put away the weakling's argument that "I can't help my likes and dislikes."

I will keep clean in body and mind.

I will not accept as a satisfactory standard what the majority of people are and do.

I will take from the world only the fair equivalent of what I give it.

I will never take revenge, will harbor no grudges and utterly eliminate any spirit of retaliation.

Life is too short for destruction; all my efforts shall be constructive.

I will not engage in any business or sport that implies fraud, cruelty or injustice to any living thing. I will hurt no child, punish no man, wrong no woman.

In everything I do I shall strive to add a little to the sum of happiness and subtract a little from the sum of misery of all living creatures.

I will constantly try to make myself agreeable to all persons with whom I come in contact.

I know death is as natural as birth, and that no man knows his hour. I will not fret at this, nor dodge it, but so live that I am ready to go.

I will believe that honesty is better than crookedness, kindness is better than cruelty, truth is better than lies, cleanliness is better than dirt, loyalty is better than treachery, and love is better than hate or coldness.

I will trust my life and my career to an unfailing reliance upon this creed.

* * *

My friend Frank I. Clark of Iver Johnson's Arm and Cycle Works, Fitchburg, Massachusetts, sends me the following story to illustrate the price situation:

A little girl was asked to go for a loaf of bread and was given the money.

"Is that enough, mamma?" she asked.

"Yes, dear, that is exactly the right amount." replied her mother.

"Well, you'd better give me a little more, 'cause the bread may go up 'fore I get there."

* * *

Woman's styles are certainly not making a great drain upon the supply of textiles, says my friend A. W. Crotsley of the Chicago office of Whitaker-Glessner Company, Wheeling, West Virginia. That is why the doctor in the following dialogue spoke as he did:

Society Lady—"Doctor, I want to be vaccinated somewhere where it won't show."

Doctor—"My dear young lady, I'm afraid I'll have to do it internally."

* * *

My friend John Frederick Balz of H. and B. Chenoweth Company, New Orleans, Louisiana, sends me a good darky story. Here it is:

"I say, Jeems, dat chile o' yourn's mighty slow larnin' at school.

"Yes, dat's 'cause de school am seben miles from heah, an' de chile fo'gits all de teacher say afo' he gits half-way home."

* * *

This is the day of feminine advancement. Woman suffrage is triumphing everywhere. But there are certain womanly traits whose absence—even in these progressive times—may well cause suspicion or alarm, says my friend Tom Gallavin of E. C. Stearns and Company, Syracuse, New York. He cites an example in the subjoined dialogue:

"So you didn't propose to her, after all?"

"No. And I'm not going to. When I got to her house I found her chasing a mouse with a broom."

* * *

The following whimsical sample of darky humor comes to me from my friend O. W. Kothe, Principal of the St. Louis Technical Institute, St. Louis, Missouri:

Two colored men, comparative strangers, were in the same seat of a day coach en route to a penitentiary.

"How long you goin' up for, bo?" inquired the first one by way of making conversation.

"Three years," was the reply.

"What was it you done?"

"Oh, they claimed I took some money. What'd you do?"

"I got mixed up with a fellow who was trifin' with mah wife."

"And how long they sent you up for?"

"From now on."

* * *

Sometimes we grow impatient because people with whom we are dealing do not reach decisions or conclusions by the shortest possible way. It is well for us to remember that the definition of a line as the shortest distance between two given points is all right enough in mathematics. But life does not run according to mathematical formulæ. We have to make allowance for grooves and twists. Often the longest way around is the shortest way home, according to the familiar proverb. I get a lot of satisfaction out of some lines of John Boyle O'Reilly:

The Straightest Course.

The faithful helm commands the keel,
From port to port fair breezes blow;
But the ship must sail the convex sea,
Nor may she straighter go.
So, man to man; in fair accord,
On thought and will the winds may wait;
But the world will hand the passing word,
Though its shortest course be straight.
From soul to soul the shortest line
At best will bended be;
The ship that holds the straightest course
Still sails the convex sea.

UP TO THE MINUTE NEWS SIFTINGS

PATENTS AN ORNAMENTAL DESIGN FOR AN OIL STOVE CHIMNEY.

It is generally admitted that there is an advantage in having patents covering everything in connection with an oil stove. It is logical, therefore, to control the patent rights of an ornamental design for an oil stove chimney. In many instances such control or ownership has very perceptible values to the selling arguments in favor of the complete equipment of such a commodity. One of the largest companies engaged in this field is the American Stove Company. The fact that they have had assigned to them the patent for an ornamental design for an oil stove chimney shown in the accompanying illustration is fairly good evidence of the practicability of such a patent. This ornamental design for an oil stove chimney was granted to Arthur Stockstrom, St. Louis, Missouri, who assigned it to the American Stove Company, St. Louis, Missouri, a Corporation of New Jersey. The claim for the patent was filed September 3, 1919. The term of the patent is fourteen years, under number 54,699. An examination of the illustration herewith will show that the design is sufficiently distinctive to individualize it. At the same time, it is not burdened with unnecessary details of ornamentation which might lessen its value by increasing the cost of production.

OPPOSES TAX ON ADVERTISING.

A protest against the Thompson Bill, which would impose a tax on advertisers, was sent to the House Ways and Means Committee by representatives of the twenty-one departments of advertising who recently attended a meeting of the National Advertising Commission in Cleveland, Ohio. The protest, which was signed by W. Frank McClure, chairman; Homer J. Buckley, vice-chairman; and P. S. Florea, secretary, declared that the Commission was opposed to the passage of the bill, "for the reason that advertising is a part of salesmanship and such a tax would be in effect a tax upon selling and would operate to reduce production at a time when the government is doing everything in its power to encourage production."

Recognizing the value of the training of prospective advertisers in advertising and marketing in universities, colleges, high schools and other institutions, and believing that there is an urgent need for a general standardization of prevailing methods and instruction in this field, the Advertising Commission directed its educational committee to investigate this matter, making plans which will result in an improvement of the present system. Charles H. Mackintosh, chairman of the educational committee, and cooperating members, will seek the assistance of all teachers of advertisers.

REGISTERS TRADE-MARK FOR STOVES, RANGES AND HEATERS.

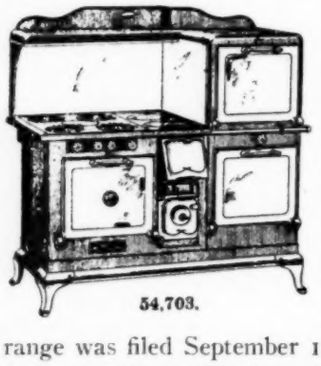
United States Patent Office registration under number 125,803, has been granted to the Quakertown Stove Works, Quakertown, Pennsylvania, for the trade-mark shown in the illustration herewith. The particular description of goods to which this trade-mark applies is coal, gas, and wood heaters, stoves and ranges. The Company claims use of this trade-mark since 1884.

ISSUES ARTISTIC STOVE CATALOGUE.

Printed on highly finished super-calendered paper, the latest catalogue of the Buffalo Cooperative Stove Company, Buffalo, New York, is a work of art. This Company manufactures Amherst stoves, warm air heaters, garbage and toilet incinerators. These various products are illustrated with halftone reproductions, some of which are in two colors. The explanatory text is set forth in large readable type and the descriptions are clear and adequate. By the aid of such a catalogue it is an easy matter to visualize the Company's products, and to get an accurate idea of their selling qualities. Dealers who realize the advantage of carrying high grade commodities would do well to write for a copy of this catalogue to the Buffalo Cooperative Stove Company, Amherst and Tonawanda Streets, Buffalo, New York.

ASSIGNS PATENT FOR ORNAMENTAL DESIGN FOR STOVE OR RANGE.

Under number 54,703, United States patent rights have been granted for a term of seven years to Thomas E. Taylor, Mansfield, Ohio. He has assigned the patent rights of the ornamental design to the Eclipse Stove Company, Mansfield, Ohio, a Corporation of Ohio. The application for the patent for the ornamental design for a stove or range was filed September 12, 1919. As will be seen from the illustration herewith the design is not excessively ornamental. That is to say, it presents no



projections or recesses in the various surfaces of the stove which would render it impractical from the point of view of the housewife. The design is pleasing in its general effect and can easily be used to particularize the stove or range to which it is applied.

REGISTERS THREE TRADE-MARKS.

Under United States Patent Office classification 34, namely, heating, lighting, ventilating apparatus, not including electrical apparatus, registration has been granted to Hemp and Company, of St. Louis, Missouri, for the three trade-marks shown in the accompanying illustrations. The trade-mark bearing the official number 126,024, is for goods described as wood, coal, and gas heaters. The application for this trade-mark was filed December 15, 1919 Use for it is claimed since about the first day of December, 1899.

MABEL
126,024.

The trade-mark shown in the illustration bearing the number 126,025 is also granted for use in connection with wood, coal and gas heaters. Hemp and Company claim use of this trade-mark since about the first day of December, 1902. This trade-mark is extremely simple in design and easy to remember. The length of time during which it has been employed by Hemp and Company has served to impress it strongly upon the minds of the company's customers. It is, therefore, natural that the trade-mark should be registered in order to preserve the valuable property rights which long use has added to this trade-mark.

MARS
126,025.

The third trade-mark, designated by number 126,181 in the accompanying illustration, has been in use by Hemp and Company, since December, 1904. The particular description of goods for which this trade-mark has been granted United States Patent Office registration is stove pipes and stove pipe elbows. All three of these trade-marks are emblems of good workmanship, sound material, and satisfactory service. Dealers and consumers are alike benefited by the establishment of standards of quality symbolized in trade-marks which have consistently carried the same methods of trustworthy commodities for so long a period of years.

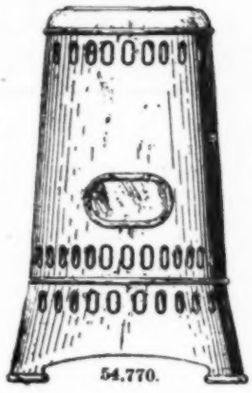
WARRIOR
126,181.

DRAW LINE ON PROMISES TO PAY.

Every merchant should know how much charge merchandise is going out the front door and also how many dollars are coming in the same way to pay for what already has been taken out. Many merchants have failed simply because they let their charge account get away from them. Such a thing probably never would have happened if they had known when to draw the line on promises to pay or when to speed up collections. Accurate figure knowledge about their business would have told them how to handle the situation at just the right time.

GETS PATENT FOR STOVE DESIGN.

Under number 54,770, United States patent rights have been granted to George F. Reznor, Mercer, Pennsylvania, for the ornamental stove design shown herewith. The term of the patent is for fourteen years. The design is exceptionally simple yet sufficiently distinct to be different from the common type of outline and ornament for this class of heating stove. An examination of the accompanying illustration will readily disclose the freedom of the design from needless details. It is quite obvious that the simplicity of design adds to the practicability of the stove from a manufacturer's point of view. In the past generation there was excess of ornamentation in heating stoves and a reaction has set in toward more severity of design and greater simpliicty.


54,770.

STOVE PATTERNS DEMAND ACCURACY IN MANUFACTURE.

A good deal depends upon an accurately-made stove or warm air heater pattern. Those who have had any experience whatever in the purchase of patterns will realize the necessity of precision in all details. No phase of stove pattern manufacture is neglected by the Quincy Pattern Company, Quincy, Illinois. This company makes special efforts to put the best workmanship in the stove and warm air heater patterns made by it. All details are carefully executed. The latest types of machinery are employed. Where specifications are of an unusual character, every care is taken to follow them out to the letter. It is said that the service given by the Quincy Pattern Company is seldom surpassed. In fact, the quality of this company's service can be likened to the merits of its products. Detailed information pertaining to any particular of pattern making can be obtained by writing to the Quincy Pattern Company, Quincy, Illinois.

GETS TRADE-MARK REGISTERED.

After more than eighteen years of continuous use in connection with its products, the Hammer-Bray Company, Oakland, California, has obtained United States Patent Office registration, under number 124,988, for the trade-mark shown in the accompanying illustration. The Company claims use of this trade-mark since about July, 1901. The particular description of goods in connection with which the trade-mark is used is cook stoves, ranges, and heating stoves exclusive of those heated by electricity; gas ranges, gas heaters, gas plates, combination stoves for solid and gaseous fuels, combination ranges for solid and gaseous fuel and portable baking ovens.

124,988.
SPARK

THE WEEK'S HARDWARE RECORD

Of Interest to Manufacturer, Jobber and Retailer

AMERICAN ARTISAN AND HARDWARE RECORD is the only publication containing western hardware and metal prices corrected weekly. You will find these on pages 68 to 74 inclusive.

The Stollberg Hardware and Paint Company have increased their capital at Toledo, Ohio, from $125,000 to $200,000.

Platte County Hardware Company has been chartered at Dearborn, Missouri, with a capital stock of $60,000 by W. S. Herndon, Attorney, Plattsburg, Missouri.

The Young County Hardware and Furniture Company at Graham, Texas, have been chartered with a capital stock of $50,000 by W. S. Husted; W. H. Pratt, and J. C. Rentz.

The Sparkman Hardware Company, Sparkman, 'Arkansas, has been chartered with a capital stock of $50,000 by G. T. Merritt; W. T. Murray; R. P. Graham, and J. W. Lee.

The Sabine Valley Hardware Company, Incorporated, of Lake Charles, Louisiana, has been chartered with a capital stock of $100,000. Their Texas headquarters are at Bonweir, and J. M. Ragland is their agent.

HARDWARE CLUB OF CHICAGO PLANS ANNIVERSARY DINNER AND DANCE.

Plans have been completed for the anniversary dinner and dance of the Hardware Club of Chicago to be held Tuesday evening, May 4, 1920, in the Club Rooms of the organization, eleventh floor of the State and Lake Building, Lake and State Streets, Chicago, Illinois. The dinner will begin promptly at 6:30 o'clock in the evening and will be followed by dancing, card games, and other forms of amusement and entertainment. The fact that the annual dinner and dance is in charge of John S. Kandy and Henry A. Squibbs, constituting the Entertainment Committee, makes its complete success a foregone conclusion.

CITY NAMES STREET IN HONOR OF DECEASED HARDWARE MAN.

A graceful tribute to the memory of William G. Hibbard, Jr., son of the founder of Hibbard, Spencer, Bartlett and Company, Chicago, Illinois, and treasurer of the company up to his entry into the War, was the action of the village council of Winnetka, Illinois, a suburb of Chicago, in passing an ordinance changing the name of Lake Street in that town to Hibbard Road. The late Mr. Hibbard had endeared himself to the people of Winnetka by his activity in civic affairs and by his untiring devotion to every movement for the betterment of its inhabitants.

MUST ADD EXPENSES TO COST.

When Duncan McCan engaged in the hardware business in a Western New York State town some time ago he made up his mind he would sell his merchandise on a close but safe margin according to a story in the American Cutler. He had seen so many other hardware dealers who never had any definite knowledge about their business that he was determined to be sure about everything he did. There was to be no haphazard guesswork with him.

Duncan McCan's ambition was all right, but in actual practice he made the same mistake that so many other hardware men have made before him. But to Duncan's good credit it is well to say that before he had been in business long he was able to set himself right. He had been in business hardly six months when he discovered that he was not making the profit he had expected. The reason for his profit shortage was revealed to him in an unexpected way.

One day he found that a number of gas plates were not selling as they should. They had cost him two dollars apiece, and he had marked them up 35 per cent a few months before, 25 per cent as expense of doing business and 10 per cent of profit, making the sale price $2.70. To move them he decided to sell them at a reduced price. So he cut the price 25 per cent and offered the salesman a commission of 10 per cent, making a total cut of 35 per cent, just the same as the mark-up. But right here is where he made his mistake, and this is how he did it:

The original selling price of these plates as we have shown, had been $2.70. So he marked this price down 25 per cent, making the selling price an even $2.00. Then to this he added the salesman's commission of ten per cent, which made his net receipt from the sale of each gas plate exactly $1.80.

To his surprise Duncan found that he would lose 20 cents on each plate, and he couldn't understand it at first, as he believed that all the time he had been working on a 35 per cent margin of profit, and had only cut his sale price 25 per cent plus 10 per cent commission. But had he really been working on a 35 per cent margin? He certainly had not if he had figured his mark-up the right way, and that was the error that misled him into marking down those gas plates 20 cents below cost when he had intended to sell them at exactly cost price.

What he really did was to mark those gas plates up on the cost price and then mark them down on the selling price. In other words he used a different base in figuring the mark-down than he did in figuring the mark-up. This accounted for his loss of 20 cents on each gas plate when he came to force their sale by marking them down. He discovered then why it was he had not been making the profit

he had expected on the rest of the stock. What he should have done in determining his original mark-up percentage was this: 100 per cent, equal selling price; 35 per cent, equal expense and profit; 65 per cent (of selling price), equals cost.

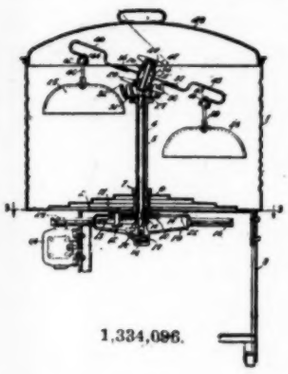
Then $2.00, the cost of one gas plate, would be 65 per cent of the selling price. Consequently, as $2.00 divided by .65 equals $3.08, this figure should have been the first selling price of those gas plates.

Here is the proof: 25 per cent expense, or $3.08 equals 77 cents; 10 per cent profit, of $3.08, equals 31 cents; 65 per cent cost, of $3.08, equals $2.00; selling price, 100 per cent, equals $3.08.

This experience with gas plates was enough to convince Duncan McCan that to figure his mark-up as 25 per cent plus 10 per cent, or $2.70, was really less than cost plus expense or $2.77. He saw at once why it was that so many hardware men have failed.

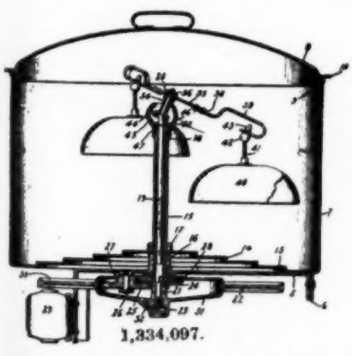
GETS PATENT FOR WASHING MACHINE.

Under number 1,334,096, and 1,334,097, United States patent rights have been granted to Earl B. Hoff, Cleveland, Ohio, assignor to Electric Vacuum Cleaner Company, Incorporated, a Corporation of New York, for washing machines described in the following:



1,334,096.

In a washing machine the combination of a casing, a shaft rising vertically through the bottom of the casing and having a wabbler crank at its upper extremity.



1,334,097.

In a washing machine, the combination of a stationary tub adapted to receive water and the material to be washed, a vertical shaft which rises from the bottom of the tub and has a wabbler crank at its upper end, bearing means for holding the shaft in its upright position, a yoke and bells mounted on the crank in which the latter is free to rotate, means which prevent the yoke and bells from rotating while permitting the crank to impart thereto a wabbler action, and means located under the tub for continuously rotating the shaft, said means acting on the lower end of the shaft.

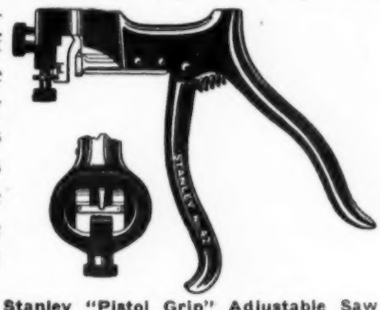
REQUESTS HARDWARE CATALOGUES.

The Fred Kroner Hardware Company, of La Crosse, Wisconsin, announce that they have begun the compilation of a general hardware catalogue. They have secured the services of a thoroughly experienced hardware man and compiler, who is now outlining the work.

The catalogue will be of standard three and one-half inch double column composition, pages nine by eleven inches, covering departments for Builders' Hardware, Building Materials, Paints and Varnishes, Mechanics' Tools, Agricultural Tools and Implements, Blacksmiths' Supplies, General Hardware, Domestic Wares, Stoves and Furnaces, Cutlery, Sporting Goods, and Automotive Accessories. They cordially invite communications and catalogues from interested manufacturers seeking representation in the work, addressed "Catalogue Department."

EMBODIES UNIQUE AND IMPORTANT FEATURES IN TOOL.

According to the Stanley Rule and Level Company, New Britain, Connecticut, manufacturers of the Stanley "Pistol Grip" Adjustable Saw Set, Number 42, this tool embodies several unique and important features not heretofore seen in tools of this description. The shape of the body and handle of this instrument enables the user to operate it with great ease and with the least possible exertion. While the tooth is being set, the saw is held firmly against the gage. The Stanley "Pistol Grip" Adjustable Saw Set can be readily adjusted by means of the knurled thumb screw to give greater or less set to the teeth of the saw. As the anvil or part against which the plunger works is graduated, the same adjustment can be easily obtained for duplicate work. This tool is so designed that the saw teeth are in plain view, thereby enabling the user quickly to adjust the tool to the tooth to be set. The plunger and anvil are made of tool steel—hardened and tempered. All parts are carefully machined and are interchangeable. The Stanley "Pistol Grip" Adjustable Saw Set has a fine black finish. For prices and circular pertaining to this tool write to the Stanley Rule and Level Company, New Britain, Connecticut.



Stanley "Pistol Grip" Adjustable Saw Set Number 42, Made by the Stanley Rule and Level Company, New Britain, Connecticut.

REGISTERS RAZOR STROP TRADE-MARK.

The Gibford-Weiffenbach Company, Adrian, Michigan, has obtained United States Patent Office registration, under number 123,207, for the trade-mark shown in the accompanying illustration. The particular description of goods to which it is applied is razor strops. The application for registration was filed September 27, 1919. Use of this trade-mark is claimed by the Company since September 10, 1919. The letters constituting this trade-mark are intended to convey the idea of speedy accomplishment from the use of the commodity with which it is associated.

P-D-Q

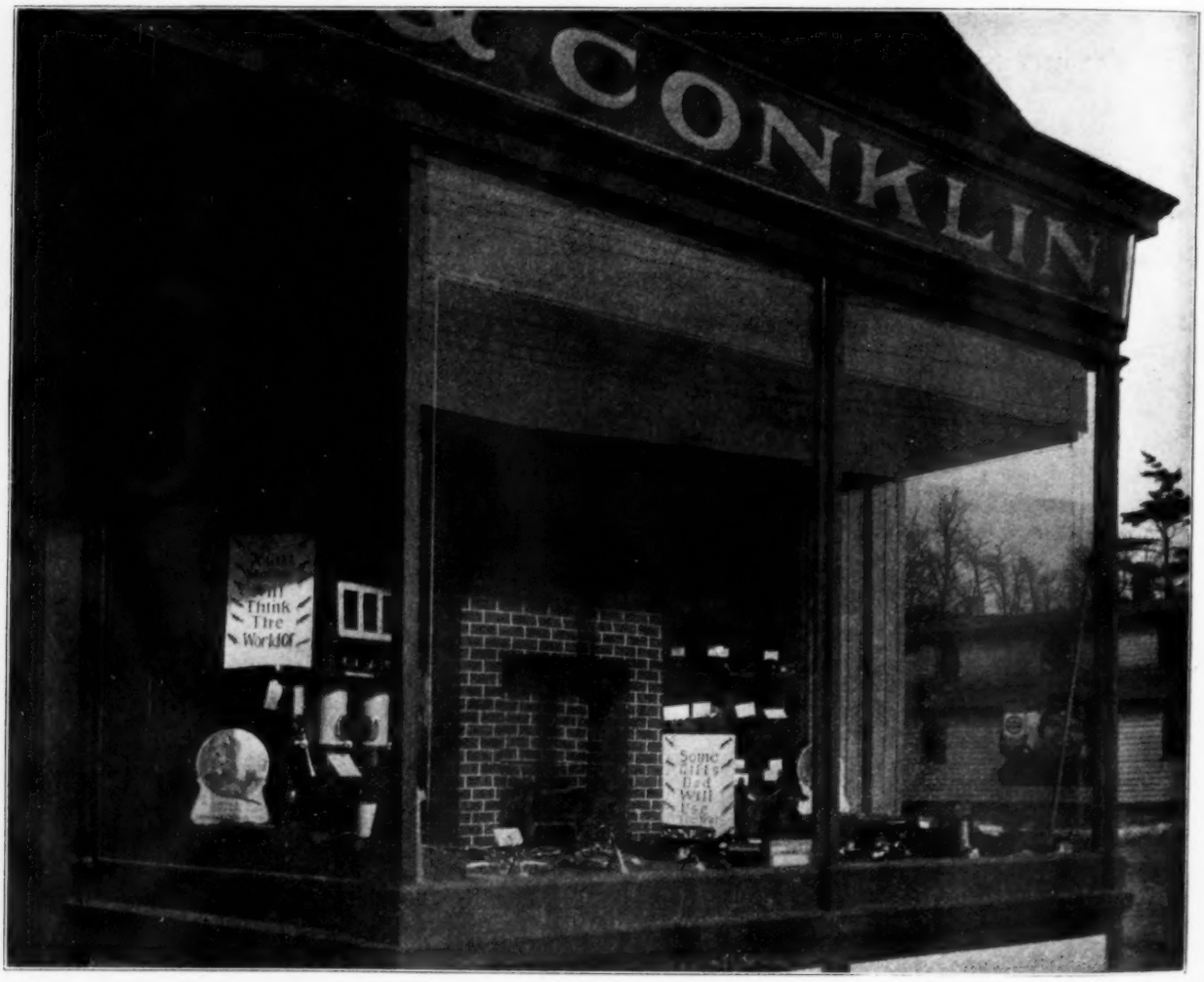
123,207.

EXHIBITS IN AMERICAN ARTISAN WINDOW DISPLAY CONTEST

OIL STOVE AND KITCHEN UTENSILS CLEVERLY DISPLAYED FORM A GAINFUL WINDOW EXHIBIT.

The apparent cynicism of the average American is merely on the surface. At heart he is just as sensitive to the appeal of the finer emotions as any human being on this little old globe of ours. Deep down in the marrow of him there is an inspiring, kindly affection. He loves his parents. His mother is to him the embodiment of all the virtues. He rejoices in opportunities of showing his love for her—often in somewhat roundabout fashion. This is amply evidenced by the fact that in no country of the world are more devices bought and placed at the service of the womenfolk of the family for lightening their household labors than in America. Since, in truth, life is not a series of unrelated developments, it is not improper or boorish or a mark of the Philistine to use this fact of love for one's parents as a basis of legitimate merchandising.

The retailer who presents a labor-saving device or an efficient set of kitchen utensils to the buying public on the plea that it will lessen the drudgery of their womenfolk is more or less consciously appealing to a fine emotion and a beautiful sentiment. But he is not improperly exploiting that trait of American character. He is doing a service to the people when he exercises his function as a distributor of these instruments of home comfort. It is, therefore, good salesmanship as well as constructive business to present to the passer-by such a selling appeal in connection with the window display of oil stoves and kitchen utensils as Thomas V. Pickering uses in the window exhibit herewith reproduced. This display was awarded honorable mention in AMERICAN ARTISAN AND HARDWARE RECORD Window Display Competi-



Window Display of Oil Stoves and Kitchen Utensils, Awarded Honorable Mention in AMERICAN ARTISAN AND HARDWARE RECORD Window Display Competition. Arranged by Thomas V. Pickering for Conklin, Tubby and Conklin, Roslyn, Long Island, New York.

tion. The designer of the display explains it as follows:

"First is the thought of what will attract attention. A fireplace does that very thing. It is very easy to make—some ⅜ by 1½ lattice and crêpe paper which we had in stock served the purpose. The fireplace is one which was used in our store ten years ago. The logs were scorched before being put in the window. A place was left in the center for an electric light bulb. This window made an attraction day and night.

"The back of the window was decorated with red crêpe paper cut in one inch strips and it was tacked at the bottom and top and spread out between. There were two long stands on the side of the window I always used and which I made myself from ½ by ½ pine and Beaver boards. They are covered with twisted green crêpe paper. One stand holds carving sets and the other hammers and sharpening stones. On the back of the stands are cards containing pocket knives.

"One half of the window was used to appeal to the womenfolk, the other half to the men. On the left side of the window is a three burner perfection oil stove with a poster reading as follows: 'A Gift Mother Will Think the World Of.'

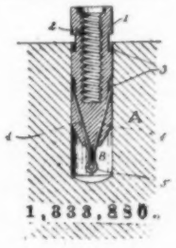
"One of the stoves was sold two days after the display was put in. It was bought by a young man for his mother. He paid spot cash and we held it for him till the night before her birthday when it was sent to her as a present from him. In this same portion of the window we also displayed ice cream freezers, food choppers, shears, spoons, knives and forks, knife sharpeners. The knives and forks were completely sold out and the other goods were disposed of at a gratifying rate of sale.

"On the right side of the window on the stand are hammers and sharpening stones. In the back is a stand fitted with vises and grindstones. The floor is filled with 'Yankee' screw drivers, drills, braces, tire chains, tire pumps, pocket knives, planes, scrapers, levels, miter box, socket wrench sets, etc. All of these are presented as everyday, useful, lasting gifts. The sign, which has a general application for this part of the window, reads as follows: 'Have some gifts dad will use the year round.'"

A practical characteristic of this window display was that every article in the exhibit was plainly marked with a price tag. This was a great help to the busy shoppers and undoubtedly a time-saver. An important element of window display is precisely this one of letting the passer-by know the price which he will have to pay for the article when he comes into the store. If he likes it from a study of it in the window, the sale is quickly completed when he comes in to buy it. There is no haggling. He does not need to be convinced of its usefulness or the reasonableness of its price. He knows in advance what it is going to cost him. He has studied it carefully. He saves his own time. By having his decision already made he saves the salesman's time. That leaves more time for making other sales. The result is that the volume of sales within a given period is greater per salesman than it would be in a case where prices are not plainly set forth and much precious time must be spent in the preliminary persuasion and defense of what appears to be a lack of fixed price for every customer who enters the store. Taken all in all, this was a gainful window display and is deserving of the close study of every merchant who seeks to enlarge his business through the powerful medium of window display.

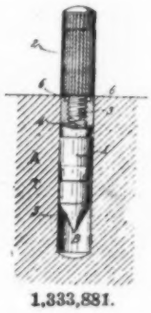
PATENTS DRIVING TOOL AND LOCK FOR ANCHOR SOCKETS FOR SCREWS.

United States patent rights have been procured by Isaac D. Stine, Waterbury, Connecticut, assignor of one-half to Frank Hayes, Waterbury, Connecticut, under numbers 1,333,880 and 1,333,881, for a lock for anchor sockets for screws and a driving tool for anchor sockets for screws described herewith:



In combination, an anchor socket for screws, a hole extending from one side of to the bottom of said socket, a pin of greater length than said hole adapted to slide therein, and a head on said pin.

In combination, an anchor socket for screws provided at one end with a driving head, the outer surface of said socket being irregular, the inside of said socket being provided with screw threads, and an enlarged recess in the upper part of the socket above the screw thread portion thereof, thus providing a thin walled portion adapted to cooperate with a driving tool, and a driving tool for said socket provided with a flat surface adapted to engage the top of the socket and a threaded extension from the center of said flat surface adapted to engage the screw threads of the socket.



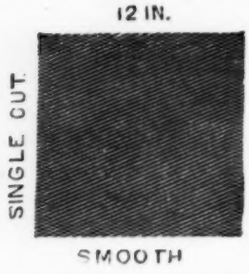
OPENS A BRANCH OFFICE IN DETROIT.

Announcement is made by Merchant and Evans Company, of Philadelphia, Pennsylvania, that for the greater convenience of its present customers, and the trade in general, it has opened a branch office at 926 Chamber of Commerce Building, Detroit, Michigan, for the handling of its business in Detroit and vicinity. The establishment of the new office has been rendered necessary by the growth of the company's business in that locality and the desire to afford its friends the convenience of a local office rather than handle their business through the old established offices and warehouses in Chicago and Cleveland. The Detroit branch of Merchant and Evans Company will be under the management of R. Frank Smith, who is well known to the trade and who for nearly twenty years as salesman and branch manager for the Company has been one of the most energetic, able, and thoroughly well posted men in the trade.

Progress must be carefully watched.

CAREFULLY SELECTS STEEL USED.

Great care is exercised in the selection of the steel which is used in the manufacture of the file, illustrated herewith, made by the Heller Brothers Company, Newark, New Jersey. Since 1836 this company has been making rasps, files, farriers' tools and machinists' hammers. All the tools produced by the Heller Brothers Company are made of a special refined clay crucible tool steel. Machines of a patented construction are employed. The long practical experience combined with the up-to-date facilities of production of this company enables it to manufacture a uniform line of goods of high quality. Every horse rasp made has the Heller Brothers Company trade mark. In all parts of the world, hardware dealers handle the make of files manufactured by the Heller Brothers Company. For every particular kind of work this company can supply a file. In its catalogue are described a vast assortment of files and rasps. A copy of this catalogue can be obtained from the Heller Brothers Company, Newark, New Jersey.



Twelve Inch Mill Smooth File, Made by the Heller Brothers Company, Newark, New Jersey.

TRADE-MARK IS REGISTERED.

Simonds Manufacturing Company, Fitchburg, Massachusetts, has secured United States Patent Office registration, under number 121,729, for the trademark reproduced herewith. The pictorial representation of the man forming part of the mark is fanciful. No registration right is claimed for the word "Warranted" or the phrases "Works, Fitchburg, Massachusetts, Chicago, Illinois, U. S. A.," and "Unequalled in Quality and Uniformity" apart from the mark shown in the drawing. The particular description of goods is saws, and the Company claims use since 1915.

FEATURING SMALL ARTICLES INCREASES DEALER'S PROFITS.

There are many small articles which if featured by the hardware dealers would be a source of large profits. They are such goods which, though not acutely needed by the average household, yet could be employed to advantage. In the illustration herewith is depicted the Stover Waffle Iron, made by the Stover Manufacturing and Engine Company, Freeport, Illinois, an article exemplifying the many products which could be profitably displayed by hardware dealers. The Stover Waffle Iron is an article of uncommon manufacture. It will bake waffles economically and in a short time. Being made of a high grade of cast iron it will wear an indefinitely long time. The plates in this iron are said to be an improvement far in advance of the old types. Handles on the Stover Waffle Irons can be furnished in either wood or iron. Dealers should write to the Stover Manufacturing and Engine Company, 719 East Street, Freeport, Illinois, for details concerning these goods.

Stover Waffle Iron, Made by the Stover Manufacturing and Engine Company, Freeport, Illinois.

LET YOUR WINDOWS SELL GOODS.

Force of circumstances will drive a man to buy an article which would otherwise go unpurchased. It is this message which your displays should carry. No dealer can expect a brisk trade on his stock if he waits for the customer to find out his needs at the time of greatest necessity. Suggest these needs to him beforehand—as often as is necessary until he has purchased.

Both the windows and show case can be used as silent salesmen—salesmen who carry their messages only to those who are interested—insistently, persuasively. The customer is impressed more by a visual impression than by the mere gush of high-sounding verbiage. To let a man see or feel an article is to create the desire to own it—and a sale is easy after that desire has been created.

Make your counters and windows pay for the space they are taking in your shop. They occupy the two most valuable portions of your salesroom and as such, should be made to work to their best advantage and at every opportunity. All they want, like any salesman, is a chance. A clean and neat appearance, without too many red posters and brass bands, a few well-pointed tags and there you are.

E. C. Simmons.

After a long life of constructive merchandising and sincere service to the trade as well as to his fellowmen in general, E. C. Simmons, founder of the hardware company which bears his name, died of heart failure at his home in St. Louis, Missouri, April 18, 1920. He was eighty years of age. For more than sixty-four years he had been identified with the hardware trade. By virtue of his strong personality and his forward looking habit of mind, he succeeded in building up one of the most influential hardware companies in America. He considered friendship the most important asset in business and he was instrumental in training some of the cleverest salesmen in America along lines of cheerful service rather than of mere distribution of commodities.

The Simmons Hardware Company of St. Louis, Missouri, is the most eloquent monument to his memory. Its immense trade and the marvelously vital spirit of honesty, quality, and service which inspires its entire personnel from the errand boys to the executive staff are due chiefly to the genius and bigheartedness of the man who, in passing onward, has left a priceless heritage to everyone who knew him.

PRESENTED BY BUREAU OF FOREIGN AND DOMESTIC COMMERCE.

The Bureau of Foreign and Domestic Commerce, through its Special Agents, Consular Officers and

Commercial Attachés, is receiving information of opportunities to sell hardware and kindred lines in several foreign countries. Names and locations will be supplied on request to the Bureau in Washington or its District Offices. Such requests should be made on separate sheets for each opportunity, stating the number as given herewith:

32540.—A merchant firm in Spain wishes to secure an agency for the sale in that country and Portugal of automobile accessories, cutlery and tools. References.

32545.—A firm of ironmongers in Scotland desire to secure the sole agency for the sale of kitchen ranges, portable stores, vacuum cleaners, general ironmongery supplies, cutlery, etc. Quotations should be given c. i. f. Leith. Payments monthly. References.

32547.—A merchant firm in the Netherlands desires to secure agencies and purchase asbestos, asbestos packing, grinding wheels and grinding machines, hacksaw blades and other saw blades, pipe and other wrenches, and all sorts of tools.

32568.—A furniture manufacturing company in Newfoundland desires to purchase and secure an agency for cabinet hardware, sofa springs, and enamel ware. Quotations should be given f. o. b. American ports. Payment, 30 days from receipt of goods, or 2 per cent off for cash. Reference.

32551.—A manufacturing company in South Africa wishes to purchase hardware, etc. Quotations should be given c. i. f. Durban. Payment, cash. Reference.

32555.—A merchant in Palestine desires to purchase and secure an agency on commission for the sale of hardware and tools, etc. Quotations should be given c. i. f. Jaffa. Payment, 25 per cent in advance, balance against documents. References.

COMING CONVENTIONS.

Southeastern Retail Hardware and Implement Association, embracing Alabama, Florida, Tennessee and Georgia State Retail Hardware Associations, Atlanta, Georgia, May 4, 5, 6, and 7, 1920. Walter Harlan, Secretary, 701 Grand Theater Building, Atlanta Georgia.

Louisiana Retail Hardware and Implement Association, Alexandria, Louisiana, May 10 and 11, 1920. R. D. Nibert, Secretary-Treasurer, Bunkie, Louisiana.

Stove Founders' National Defense Association, Boston, Massachusetts, May 11, 1920. R. W. Sloan, Secretary, 826 Connell Building, Scranton, Pennsylvania.

Hardware Association of the Carolinas, Imperial Hotel, Greenville, South Carolina, May 11, 12, 13, and 14, 1920. T. W. Dixon, Secretary, Charlotte, North Carolina.

Southern Hardware Jobbers' Association, Marlborough-Blenheim Hotel, Atlantic City, New Jersey, May 11, 12, 13, and 14, 1920. John Donnan, Secretary, Richmond, Virginia.

American Hardware Manufacturers' Association, Marlborough-Blenheim Hotel, Atlantic City, New Jersey, May 11, 12, 13, and 14, 1920. F. D. Mitchell, Secretary, 4106 Woolworth Building, New York City.

Old Guard Southern Hardware Salesmen's Association, Marlborough-Blenheim Hotel, Atlantic City, New Jersey, May 12, 1920. R. P. Boyd, Secretary, Knoxville, Tennessee.

National Association of Stove Manufacturers, Boston, Massachusetts, May 12 and 13, 1920. Robert S. Wood, Secretary, National State Bank Building, Troy, New York.

Metal Branch National Hardware Association of the United States, Hotel Cleveland, Cleveland, Ohio, May 21 and 22, 1920. W. H. Donlevy, Chairman Metal Committee, 1012-1014 Cherry Street, Philadelphia, Pennsylvania.

National Association of Sheet Metal Contractors, Peoria, Illinois, June 8, 9 and 10, 1920. Edwin L. Seabrook, Secretary, 261 South Fourth Street, Philadelphia, Pennsylvania.

Ohio State Sheet Contractors' Association, Toledo, Ohio, July 20, 21, and 22, 1920. W. J. Kaiser, Secretary, Columbus, Ohio.

RETAIL HARDWARE DOINGS.

Arizona.

Krakauer, Zerk, and Meyers Company, of El Paso, Texas, has just established a branch of its great hardware store in Phoenix. It will be managed by C. W. Fulkerson.

Arkansas.

The Sparkman Hardware Company, has been incorporated at Sparkman with a capital of $5.000. Incorporators are: C. T. Merritt, W. T. Murray, and R. P. Graham.

The Fones Brothers Hardware Company has added to its stock at Little Rock the entire hardware stock of Hellis and Company.

Indiana.

The Searey Hardware Company of Fort Wayne has changed its name to the Wayne Hardware Company.

Illinois.

Lunch Brothers have bought the Fred Schmal hardware store at Lowell.

Iowa.

O. E. Short has sold his hardware business at Auburn to Goddard and Schultz.

T. J. Gilbert has been succeeded in his hardware business at Perry by C. C. Parsons.

Kansas.

Rankin Brothers have purchased the G. Sneed hardware business at Pratt.

The stock of hardware, implements, and fixtures of the Hodge Brothers' store has been shipped to Bird City where a new store will be started.

G. Sneed has completed the sale of his stock of hardware and hardware fixtures at Pratt to Rankin Brothers of Perry. They will soon open an up-to-date hardware store.

Fire of unknown origin destroyed the hardware store ware Company at North Bend.

Albert Degner has sold his hardware business at Norfold to Tom W. Johnson.

Ohio.

Hilton Griswold and Rolla Moses have purchased the Miller hardware store at Urbana and will continue to operate it under the firm name of The Miler Hardware Company.

The Wright Hardware Company has been incorporated at Osford with a capital of $30,000. The incorporators are N. C. Wright, Pressley Wright, Mrs. J. L. Wright, and Mrs. M. B. McDill.

Oklahoma.

The McMillan Hardware Company, of which J. E. and John McMillan were the owners, have disposed of their stock at Madill to John McMillan, S. P. Boyd, H. B. Wiggs, and H. B. Taliaferro.

Sherer and Harris have finished their invoicing of hardware stock recently purchased from Young Brothers and Guthrie at Mangum and are now ready for business.

Texas.

The stock of the Alvin Hardware Company at Alvin was sold recently by H. W. Brown, assignee, of Houston, at public auction. W. H. Baker bought the store and will be ready for business in a short time.

R. T. Oldham has sold his interest in the Blair Hardware Company at Gatesville, to D. Blair, who now becomes sole owner.

The Eastland Hardware Company at Eastland has been purchased by Jack Williamson of Big Springs and Tom Harrell of Eastland.

J. T. Webster will discontinue his hardware business at Pittsburg soon.

of George W. Ultch Lumber Company at Rago.

R. S. Haynes has bought the store building and warehouse occupied by his hardware and implement business at La Cygne.

James Logan has sold his entire implement and harness stock at Oberlin to J. C. Nitsch.

Missouri.

Stubbs and Son have sold out to the Cole Hardware Company at Bethany.

Gench Brothers have sold their furniture and hardware business at Rich Hill to H. D. Waller.

J. P. Klumpp has moved his stock of hardware and furniture from North Sixth Street, to the Miner Building formerly occupied by the Harris Drug Store at Rich Hill.

T. W. Rogers has traded his hardware store on South Franklin Street, Kirksville, to H. E. Jones, the realty man, for two pieces of city property.

George M. Smith has sold out his hardware and furniture business at Sweet Springs to Lien Scott of Banner Springs, Kansas.

The Reed Spring Mercantile Company has taken charge of the Roy Drahn mercantile business and hardware store at Reed Springs.

The Woodruff-Seyb Company, hardware dealers, have purchased the building on the west side of the square now occupied by W. Dunn Hardware Store at Kahoka. They will be in their new location after May 1st.

The Gench Brothers have sold their stock of hardware and their building at Rich Hill to E. D. Waller.

The Farmers' Hardware Company has been chartered with a capital stock of $20,000 by George Pearce at Clever.

Minnesota.

Neuman and Pieper will open a hardware store at Blooming Prairie.

Kelley Hardware Company at Duluth have changed their name to Kelley Duluth Company.

Carl Cinery has bought a hardware and furniture business at Westport.

Nebraska.

Brehn and Goodridge have opened a hardware business at Nehawk.

J. J. Gaughen is now sole owner of the Gaughen Hard-

Paul Levit of Galveston has opened an exclusive hardware store at Strawn.

Washington.

L. M. Collins of Rockford has opened a branch hardware and implement store at Tekoa, Washington.

Wisconsin.

T. B. Thompson has bought a building at McFalland and wil remodel same for his hardware and paint business.

ADVERTISING CRITICISM AND COMMENT

Helpful Hints for the Advertisement Writer

In a summary of analyses of advertisements derived from 345 letters of inquiry, it was found that "impression of reliability" was considered as constituting twenty-two per cent of the value of an advertisement. Sincerity, frankness, and careful regard for exact statement of truth are the chief factors in producing the impression of reliability. These factors are manifested in the advertisement of The Haberman Hardware Company, Marion, Ohio, which is re-

Practical Housewives Demand a

Globe Range

"How can I reduce food costs?" is a most important problem these days. A GLOBE RANGE will help you It saves food—produces better baking and uses much less coal than any range we know of.

The special features in a GLOBE RANGE all aid in producing perfect baking and economical cooking. You pay for no useless "frills."

The smooth silver nickel—the smooth plain castings—the electric-welded construction—the 25 year insurance policy—the coal saving fire-box all join in giving you the most durable construction and genuine lasting satisfaction.

You should visit our store and see for yourself the wonderful ranges built by the Master Stove Builders of America.

The Haberman Hardware Co.

printed here from the *Marion Daily Star,* Marion, Ohio. The impression of reliability derives from every line of the copy. The advertiser is fortunate in having for his subject a standardized commodity which is consistently kept before the public by intelligent cooperation between the manufacturer and the dealer. Especially commendable is the terse and convincing style of the third paragraph of this advertisement, namely: "The smooth silver nickel—the smooth plain castings—the electric welded construction—the 25 year insurance policy—the coal saving fire-box all join in giving you the most durable construction and genuine lasting satisfaction." The illustration is well chosen and suggests the actual buying transaction, which is good merchandizing psychology.

* * *

There was a time, before the great World War, when many advertisers felt a reasonable hesitancy about stating prices for commodities in their advertisements when such prices reached a sum of more than fifty or one hundred dollars. In such cases they depended upon getting people in their stores and holding back mention of the price until they had fully explained and demonstrated the merits of the article which they were trying to sell. Nowadays, however, a price of fifty or one hundred dollars causes no uneasiness in any class of customers. The general prosperity and its accompanying high prices have

ROUND OAK
HEATERS
The double burner Round Oak Stoves burn coal, coke or wood and by their efficiency save one-third the fuel cost.
Let us show you this wonderful heating stove.
Round Oak Chief
RANGES
Burns all fuels, gas, coal, coke or wood and saves the fuel cost.
George A. Hall
212-214 College St.,
Burlington, Vermont

thoroughly accustomed the people to selling quotations which would have caused them much uneasiness ten years ago. Therefore, there is no reason why George A. Hall, Burlington, Vermont, should not plainly state the prices of the Round Oak Stoves which he describes in his advertisement reproduced herewith from *The Burlington Free Press and Times,* Burlington, Vermont. With the exception of this omission, the advertisement is well designed and calculated to make a favorable impression upon prospective patrons. The illustration is clear and graphic and there is plenty of white space to keep the text of the advertisement from appearing to be cramped or crowded.

* * *

The darkest hour in any man's career is that wherein he first fancies there is an easier way of gaining a dollar than by squarely earning it.—Horace Greeley.

HEATING AND VENTILATING

FURNACE MAN IS A CANDIDATE FOR DELEGATE TO THE NATIONAL DEMOCRATIC CONVENTION.

A man who practices what he preaches is William D Cover of Schill Brothers Company, Crestline, Ohio, makers of warm air heaters. He believes that we ought to send business men not only to our different legislatures but to political conventions as well, in order that their influence may be exercised in the promotion of sound business principles in Government. He possesses the courage of his convictions. He is, therefore, willing to make the necessary sacrifices to put his beliefs into effect. He is not a politician in the ordinary sense of the word. He does not follow politics as a profession. But he holds that good citizenship should dominate both political parties. He is a candidate for delegate to the National Convention of the Democratic Party at San Francisco. His name appears on the ballot for the primary election of Ohio, which is to be held Tuesday, April 27, 1920. Two delegates are to be voted for and both are pledged to vote for Governor Cox as the candidate for the Presidency of the United States at the forthcoming National Democratic convention.

WANTS WARM AIR HEATER CATALOGUES FROM THE MIDDLE WEST.

To American Artisan and Hardware Record:

I am desirous of getting in touch with manufacturers of a line of low and medium priced warm air heaters in the Middle West. I should like to receive catalogues and price lists. The only reason why I seek catalogues and prices from manufacturers and jobbers in the Middle West is so that freight to Oklahoma City will not be too high as it would be from territory farther away.

Very truly yours,

J. M. Prall.

1618 North Broadway, Oklahoma City, Oklahoma.
April 18, 1920.

ASKS COOPERATION IN PREPARING WARM AIR HEATER DATA.

A circular letter is being sent out to warm air heater installers and sheet metal contractors throughout the trade soliciting their cooperation in preparing data. George Harms of F. Meyer and Brother Company, formerly President of the National Association of Sheet Metal Contractors of the United States, who is sending the letter to all of the local associations of sheet metal contractors, urges a prompt reply from all who receive it. The letter is as follows:

"The Trade Development Committee of the National Association of Sheet Metal Contractors is arranging for a big task that should be of interest to everyone engaged in sheet metal work.

"The proposition is to prepare a catalogue which will contain data regarding everything pertaining to our line of business. We hope to show how galvanized iron cornices should be constructed and erected. Will also show how to apply tin roofs. Many other branches of the sheet metal business will be handled in a similar manner.

"The writer and E. B. Langenberg of St. Louis have been delegated to prepare specifications for warm air furnace installation, also to suggest building codes covering this line of work. We realize that it is quite a task to arrange this to meet the requirements of different sections of our country. Therefore, we take the liberty to call upon your association also all other sheet metal contractors to assist us with this work.

"Please delegate someone immediately to prepare proper data regarding furnace installation and building codes, as pertaining to your locality, together with any suggestions you may have along this line. After hearing from the different sources, we will make a report in accordance with them, and submit it to the National Convention which is to be held in Peoria June 8th to 11th.

"Yours truly,

"George Harms."

MAKES AN ADDITION TO ITS PLANT.

For the purpose of enlarging its productive facilities in order to take care of its rapidly increasing trade, the Rybolt Heater Company of Ashland, Ohio, is making a two-story, 66x122 feet, addition to its plant. When completed, the new structure will be equipped with the best modern devices for production and the latest conveniences for the welfare of the company's employees.

ANNOUNCES CHANGE OF NAME.

Effective April 7, 1920, the corporate name of The Henry-Miller Foundry Company, Cleveland, Ohio, has been changed to the Henry Furnace and Foundry Company, with plants at Cleveland, Medina, and Chagrin Falls, Ohio, and Indianapolis, Indiana. The officers of the Henry Furnace and Foundry Company are: T. E. Henry, President; E. S. Moncrief, Vice-President; M. L. Spackman, Secretary; and D. H. Rickard, Treasurer.

You make but a poor trap to catch luck if you go and bait it wi' wickedness. The money as is got so's like to burn holes i' your pocket."—George Eliot.

Confidence Marks Convention of National Warm Air Heating and Ventilating Association.

Confidence was the prevailing note of the Seventh Annual Convention of National Warm Air Heating and Ventilating Association, held Wednesday, April 21, 1920, in Hotel Cleveland, Cleveland, Ohio. Confront with the many perplexities of abnormal conditions of labor, supplies, markets, and distribution, the members of this Association have not allowed themselves to be depressed by the forecasts of disaster or panic which are causing uneasiness among men of less intelligently organized industries. They are not visionaries who accept only the facts which fit a theory or nourish a delusion. Neither are they of the sort who put on sackcloth and ashes and blubber a wail of woe to the high heavens because our country did not readjust itself over night from the effects of the war. They did not gather in Cleveland to chant a dirge of regret for the days that are gone nor to fret one another with forebodings of calamity and ruin. They made no attempt to minimize things as they are, but they kept firm hold upon the dynamic truth that America is stronger than any untoward combination of circumstances. In point of numbers and enthusiasm, it was the biggest gathering in the history of the Association. The members were especially drawn to the Convention by the splendid report of the Warm Air Furnace Research staff of the Illinois University—a work of high scientific and practical value to the trade.

Convention Button.

When the Convention opened at 10 o'clock, Wednesday morning, April 21, 1920, in Hotel Cleveland, Cleveland, Ohio, the President's table was decorated with a profusion of beautiful flowers furnished by the Henry Furnace and Foundry Company of Cleveland.. Here was a touch of sentiment which was appreciated by the meeting. It helped symbolize the sincerity of the welcome which the Cleveland members extended to the assembly.

The first session was called to order by W. G. Wise of Akron, Ohio, President of the Association. The calling of the roll and the reading of the minutes were dispensed with and the Convention quickly disposed of routine matters. Six applicants for membership were voted on and accepted.

Then came the President's address, which was an informal talk on the progress of the Association. At the conclusion of the President's address, the six newly accepted members were admitted to full participation in the work and privileges of the organization.

I. L. Jones of Utica, New York, Treasurer of the National Warm Air Heating and Ventilating Association, submitted his report of the finances. The Auditing Committee found it correct in every detail and made declaration to that effect.

Next came the annual report of Secretary Allen W. Williams—a comprehensive survey and analysis of the industry during the past year. It is so accurate and informative a digest of conditions and tendencies that it is herewith reproduced in full for the benefit of the trade in general:

Annual Report of Allen W. Williams, Secretary National Warm Air Heating and Ventilating Association, Delivered to the Convention of the Organization, Wednesday, April 21, 1920, in Hotel Cleveland, Cleveland, Ohio.

Nothing has developed which has indicated it is wise or possible to collect detail statistics in reference to our industry, hence the Executive Committee directed that the policy of last year be followed, namely, to make only one inquiry from the manufacturers, which was:

What was the percentage of increase or decrease in the total number of furnaces (pipe, pipeless and room heaters) you manufactured during 1919 as compared with 1918?

W. G. Wise, Re-elected President National Warm Air Heating and Ventilating Association.

The answers received were: 69 houses reported increases; 5 houses report decreases; 28 houses report no change.

While any conclusion from the replies received can not be considered more than an interesting estimate, the increases reported appeared to approximate 20 per cent, and the decrease 18 per cent. Also please note that the houses reporting decreases were comparatively few. In making this estimate the reports of houses who have only been making warm air heaters during 1918 and 1919 have not been considered.

I am frank to say that the increases shown for 1919 may have been due to the fact that 1918 was a war year, and it might therefore have been better to have compared 1919 with 1917. Nevertheless, undoubtedly the production in 1919 increased over 1918, notwithstanding that in 1919 the industry was without the large government orders of 1918. If I were to venture an estimate as to the increase in the number of

units made in 1919 over the production of 1918, I would say 30,000.

Popularity of Warm Air Heater Is Growing.

As you know, home building was far below the pressing needs of 1919 for houses, and even making allowance for the sales of pipeless heaters, the demand last year proves beyond question the growing popularity of warm air heating and argues well for the immediate future of our industry.

As far as the demand for our goods is concerned, there is no question but what the industry is in a prosperous condition, although the high cost of production, inefficiency of labor, contingent or unforeseen costs, and taxes, may not leave the net profit that should reasonably be expected.

Collection Department.

Number of accounts received for collection to date, 784.
Amount of same, $63,875.01.
Amount collected during the year, $5,348.75.
Total collected to date, $43,868.83.

The collection fees now charged by Collection Agencies are about 50 per cent higher than before the war, and as there is no charge to the members by the Association on amounts collected unless attorney is used, and in many cases we are able to collect without using attorney, I am sure the use of our Collection Bureau would save you money.

Costs Have Materially Advanced.

At our last annual convention it was reported that our costs were on the highest plane in the history of our

Allen W. Williams, Re-elected Secretary National Warm Air Heating and Ventilating Association.

industry, and since that time they have materially advanced as to labor, material and overhead. Constant statements are made that costs are coming down. Undoubtedly, such a change will come some time, but there is nothing of the kind in sight for us during the balance of 1920. We all hope that the peak has been reached, but even this seems very doubtful. Some of the best judges of conditions and tendencies are of the opinion that prices will go no lower for some time to come.

Mr. Royal Meeker, Commissioner of Labor Statistics, said earlier in the year:

"The most important constructive work that can be done in any field is the establishment of a stable standard of value, so that all the people, rich and poor, employer and employee, bondholder and stockholder, may be spared for all time the agonies of changing price levels."

Those in our industry will appreciate the truth of this statement.

Advertising Department.

It has been rather a surprise to find that requests for the booklet we purchased for our advertising campaign have been quite numerous during the year. About the first of January the Executive Committee directed me to divide and send to the members the balance of these booklets, reserving a few in my office. This was done.

We have also sold some of the advertising supplies which had become useless, and credited the amount received to the Advertising Fund.

The Pipeless Heater.

The majority of furnace manufacturers now have a pipeless or one-register heater in their line, and the sale of same continues to grow. Perhaps it affects the sale of pipe jobs, but if it does there has been no serious complaint. I believe it has to quite an extent created a field of its own. In other words, developed buyers of warm air heaters who otherwise would not have purchased furnaces of the pipe type.

Our Research Activity.

The interest in this deserving work has been maintained with rather surprising patience since the preliminaries and equipment necessary before any actual testing could be undertaken have required a considerable part of the past year.

The enthusiasm of Professor Willard and his assistants has increased as the work has advanced, and what we are doing at the University of Illinois is attracting national attention and is commanding the respect of heating and ventilating authorities.

During the past year more frequent bulletins of the progress of the work have been issued, and Professor Willard has given his time generously to our industry and to the individual manufacturers. Our special Committee on Warm Air Furnace Research has coöperated with our Executive Committee and their report will give you the details, the two committees having held a joint meeting at the University last November.

When I visited the University last November I was surprised at the equipment and time being spent on our research work, and I earnestly urge every member who has not done so to visit the plant at Urbana. Everyone who has done so has been convinced of the value and thoroughness of this activity.

The results of our research work will also afford a means of reaching and winning the architect. As you are well aware, we have needed reliable and conveniently arranged engineering data to properly interest him. There are said to be 16,000 architects in the United States.

The Question of Fuel Economy.

During the past year much of interest has developed as to the supply and kind of fuels available and most economical for use in warm air heaters, and this subject is bound to be of vital interest from now on.

For many years in localities supplied with natural gas, it has been used in the regular coal furnace, but with decreasing success as the supply diminished. You are, no doubt, aware that the Department of the Interior is giving the conservation of natural gas special attention, and a governmental committee has been appointed to make recommendations to that end. It is freely stated that the burning of same in coal furnaces is extremely wasteful and that steps would in all probability be taken to prohibit it. This means that in the near future there will be little or no demand for the furnace gas rings we have made and sold for years.

The producers of hard coal are asking a change in size, most commonly used in our goods. What results their effort may bring are uncertain.

Soft coal is of interest because of the large variance in its heating values and heavy advance in price. In connection with soft coal it would seem that much of the dirt and objection to same might be eliminated if forced economy would furnish in quantity coke from which the by-products have been taken. The United States Bureau of Mines has published an interesting paper entitled "Why and How Coke Should be Used for Domestic Heating."

Crude oil as a fuel is attracting increasing attention and would seem quite ideal. Its problems are said to be the storage of same and the special and expensive burners required, as authorities state it will require approximately 20 per cent more storage room than the same relative amount of coal. It is said to contain from 18 to 20,000 British Thermal units per pound, as against 13 to 15,000 British Thermal units for soft coal. Crude oil, while successfully used in industrial plants and perhaps for large heating work, is not yet available for domestic heating. As the amount of crude oil which would be required for individual domestic consumption is not large, it is quite possible the use of same in some of its refined forms will be more practical and come first for home heating.

Articles as to Warm Air Heating.

The popularity of furnace heating is evidenced by the numerous articles which are constantly appearing in magazines, bulletins and newspapers. Many of them possess merit and are correct, while unfortunately some otherwise have been published, and when the latter have come to the attention of your officers, an effort has been made to correct them. A year or so ago we asked the Government Departments at Washington for the privilege of seeing proposed bulletins as to warm air heating, and during the past year they have been good enough to submit a preliminary draft on "Farm House Heating Systems, Part One, Warm Air Plants," to the Association, and also to authorities really interested in furnace heating.

Standardization.

The Bureau of Standards, Washington, D. C., is still actively engaged in the standardization of work which they commenced something over a year ago. They still contemplate interesting and securing the coöperation of every industry. While the governmental activity applies to engineering practices and commodities, it may not be amiss to mention under the above heading that by request I took up with the members the use of standard size catalogs by our industry, but the replies indicated the adoption of same did not meet with approval.

The American Engineering Standards Committee state that standards will not be created without giving all interested an opportunity to participate, and that any organization may request the committee to approve standards which it has formulated or to approve committees that it has appointed. Approval of standard is given when it is the substantial unanimous conclusion of a committee made up of representatives of producers, consumers and general interests and so selected that all represented have adequate representation on the section committee.

It would seem that the present part of our Association in standardization work could profitably be limited to the elimination of such styles, sizes and other variations as are non-essential and add nothing to utility.

Trade Mark.

Last year I urged the members to use our Association trade mark more, and this apparently brought requests (which have been more numerous during the past year) for cuts of same which are furnished free by the Association.

Furnace Jobbers' List.

As directed, in October I compiled list of furnace jobbers in the United States and copies of same were furnished to the members. The number of names on the list indicated the growth of our industry and some change in methods of distribution.

Freight Matters.

Consolidated Classification No. 1 became effective December 30, 1919. Comparatively, our industry has not suffered from the requirements of the new classification. On December 30th the American Railway Express put into force a rule that all castings must be boxed, barreled, crated or trussed and protected by excelsior or other cushioning material. Our Eastern members have been particularly active in an effort to secure a modification of this rule and a short time ago Mr. George S. Lee, Traffic Manager of the American Railway Express, suggested the following change: "All *fragile* castings must be boxed, barreled, crated or trussed. Fire brick weighing 50 pounds or over shipped with stoves or other castings must be packed in wooden or other substantial containers and be fully protected by excelsior or other cushioning material."

You will note from this that it proposes to separate the fire brick from the grate bars. This is some improvement, but the wording still leaves it to be determined "What are fragile castings"? It looks as if this is about all the modification we can expect.

Prospects for Our Goods.

Much has been said and written as to the alarmingly large shortage of houses. Whether this is a million or more makes little difference, for the fact remains that the need for homes is greater than ever and can not be supplied for several years to come. Therefore, the demand for our goods is apparently assured. It carries with it an opportunity to establish the popularity of warm air heating or damage its reputation almost beyond repair, as the goods furnished and the installations made are good or bad. In view of this, our research activity has been timely, and the recommendations from same are most important to push and to follow.

Someone has said: "It will be a crime if in making up the shortage of small homes all through the country provision is not made to incorporate into them the best possible heating equipment."

Proposed Federal legislation which will assist home building should receive the special encouragement of every furnace manufacturer.

Moody's Investors' Service, in an article entitled "A Review and Forecast," has this to say for 1920: "While business in many lines will not immediately fall off in volume because of deferred demand, yet the rapid expansion of the past six months at advancing prices should not be evident. With lower prices, certain industries, like building construction, should increase rather than contract."

Piece Price Plan for Repairs.

The piece price plan of charging for repairs has gained numerous converts during the past year. This custom should be made unanimous. I am satisfied that a large amount of repair business which rightfully belongs to the individual manufacturers of any heater goes to outside foundries because such trade is not properly solicited and encouraged by prompt service. This fact has been particularly impressed upon me since our last convention, and I am anxious to see that this business goes where it belongs.

Trade Acceptances.

The policy of "Closing Accounts With Acceptances" is being continued, and from all reports growing in favor. I have been requested to urge any furnace manufacturer not now asking for this form of settlement to give it a trial, as it relieves the seller from the burden of financing his customers, and enables him to regulate his business with more certainty because of the regular and prompt returns from sales.

Legislation.

During the coming winter we must expect more legislation than formerly as to the installation of our goods. Every member can assist the Secretary by bringing to his attention the proposed laws which may come to notice.

The Trade Press

During the past year the Trade Press has as usual been generous with the space devoted to the activities of our Association and our industry. They ask me to remind you that their pages are open to you as contributors. There is a publicity in reading matter which money will not buy, and their invitation in this direction should not be overlooked.

General Remarks.

One of our members has suggested that any manufacturer who is not doing so should furnish with each furnace printed instructions as to the proper use of same, and that it would be well to supplement such directions with a few simple and short rules for saving fuel.

While our Association has nothing to do with price, I believe it should endorse the recommendation of the Federal Trade Commission for an early passage of an equitable price maintenance law which will eliminate harmful price cutting of standard merchandise such as we make.

The Executive Committee have held several meetings during the year and have carefully guided with their instructions and advice the operation of the Association.

Without signalling out your several officers and committees of the past year, I can say to you that they have all been most conscientious in your behalf and this has meant more than I can tell you to your Secretary's office. It is also a pleasure to acknowledge the coöperation and support of every member during the year that has passed.

Do not forget that your Secretary is at your service in any matter, whether directly or not connected with the warm air furnace and accessory business.

After concluding his own masterly report, Secretary Williams read the report of the Executive Committee. This Committee held a meeting the day before the opening of the Convention. Cleveland was selected by the Executive Committee as the meeting place for the Association in 1921.

President Wise then appointed as Nominating Committee the following members: W. D. Cover, T. E. Henry, E. B. Langenberg, Wm. Kerch, and E. P. Miller.

Following the appointment of the Nominating Committee, the assembly was presented with the first part of the report of progress from May 1, 1919, to April 1, 1920, in warm air heater research at the University of Illinois, by V. S. Day, Research Assistant, University of Illinois. This work was done under the direction of A. C. Willard, Professor of Heating and Ventilation, University of Illinois, assisted by a research staff of exceptional scientific attainments. Professor Willard and his associates are making a contribution to the science of warm air heating whose value is as great in its industrial aspects as it is in its bearing upon the health and comfort of the people in general.

The first paper of the report is by V. S. Day, Research Assistant, University of Illinois, and deals with the "Emissivity of Heat from Covered and Uncovered Casings, Leaders and Stacks." It shows that its author has the true scientific mind, painstaking, accurate, and penetrating. The full text of his paper is herewith given with tables and diagrams:

Emissivity of Heat from Various Surfaces, with Special Reference to Warm-Air Furnace Installations—Results of Comparative Tests on Covered and Uncovered Sheet Metal Surfaces Made in Connection with the Warm-Air Furnace Investigation Conducted by the Engineering Experiment Station, University of Illinois, in Cooperation with the National Warm-Air Heating and Ventilating Association.—By V. S. Day, Research Assistant, Engineering Experiment Station.

I. Introduction.

1. *Preliminary Statement.*—The work reported upon in this bulletin was done in connection with the Warm-Air Furnace Investigation now in progress at the University of Illinois. This investigation has for its object the determination of the efficiencies and capacities of warm-air furnaces and a study of the proper conditions of installation and operation, so that furnaces may be accurately rated and properly selected for the requirements of actual service. The work is being conducted under a coöperative agreement between the National Warm-Air Heating and Ventilating Association and the Engineering Experiment Station of the University of Illinois. This bulletin is a report of the tests of heat insulating materials and surfaces made as a part of the Investigation, and is included in item (4) of the Objects of the Investigation.

2. *Previous Investigations.*—In May, 1919, it was observed in these tests that greater temperature reduction occurred in air passing through bright tin pipes covered with asbestos paper, such as are commonly used in furnace heating, than occurred in air passing through the same bright tin pipes uncovered, all other conditions in the comparative tests being the same. It was therefore evident that the actual heat loss was greater through the asbestos paper-covered pipes than through the same pipes uncovered.

This fact was reported at the annual Spring Meeting of the National Warm-Air Heating and Ventilating Association, Columbus, Ohio, June 11, 1919, as follows: " . . We found that we lost about 35 per cent more heat through the pipe covered with asbestos paper than through the same tin pipe not covered. . . This great loss amounts to approximately 5 per cent of the coal consumed. . . Furthermore, it costs from ten to fifteen dollars to cover the heat pipes of the average house installation with asbestos paper."

Because of the inefficacy of many of the present warm-air furnace heat insulating methods, it is evident that a complete study of various insulating materials, coverings and surfaces would be justified.

3. *Acknowledgments.*—Credit is due Professor A. C. Willard for the original idea of the scheme for testing the samples, and for the keen support which, as the active supervisor of the Investigation, he gave this work.

Professor A. P. Kratz gave valuable advice and assistance in the use of the thermocouples.

4. *Significant Conclusions.*—The results of the tests have been given some publicity heretofore, but not in the complete form presented in this bulletin. The following significant results as applied to warm-air furnace heating are deserving of special emphasis.

(1) The use of thin sheets of asbestos paper on bright tin heat pipes results in a waste of heat. The use should be abandoned.

(2) Uncovered bright tin pipes are more efficient carriers of heated air than asbestos paper-covered bright tin pipes. See item (4).

(3) This fact is true regardless of the degree of brightness of the tin surface.

(4) No small number of applications of asbestos piper will suffice as an insulator. Several thicknesses are necessary to make a covering equal in this respect to the bare tin.

(5) The accumulation of dust and dirt on the pipes does not greatly alter the amount of the loss.

(6) The heat loss from warm-air furnace pipes covered with one layer of asbestos paper is a serious item in the cost of heating, amounting to more than

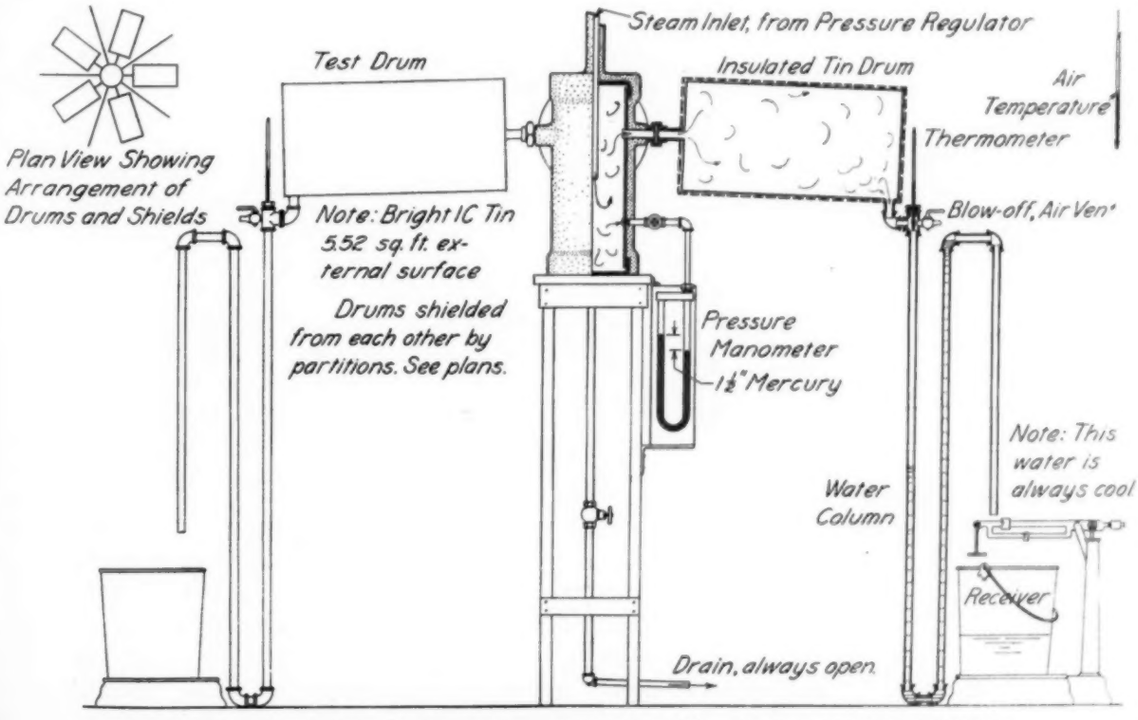

Steam Inlet, from Pressure Regulator
Test Drum
Insulated Tin Drum
Air Temperature Thermometer
Plan View Showing Arrangement of Drums and Shields
Note: Bright IC Tin 5.52 sq. ft. external surface
Blow-off, Air Vent
Drums shielded from each other by partitions. See plans.
Pressure Manometer
1½" Mercury
Note: This water is always cool
Water Column
Receiver
Drain, always open

Fig. 1—Sectional Elevation of Steam Drum Plant for Testing Surfaces for Heat Emissivity.

5 per cent of the coal consumption, depending upon the number and size of the pipes used.

(7) The fact that pipes are partly protected from convection currents of air by joists and studding does not greatly affect the loss.

(8) *Unless the insulation excels the uncovered bright tin in heat insulation properties it should not be used.*

(9) Such materials are available and the tests have shown their merits.

II. The Testing Equipment.

The report mentioned in paragraph 2, which was made at Columbus, Ohio, gave the results of tests on the Auxiliary Testing Plant (see Fig. 6). It was difficult to obtain entirely satisfactory data on this plant because of the variation in the velocity of the air flowing up the leader and the difficulty of correctly measuring the temperature of the air, as described later in this bulletin. It was therefore decided that a special apparatus should be devised which would eliminate possible errors in temperature measurements.

5. *Description.*—The apparatus here described, (Figs. 1 and 2) was the one used in the tests reported in this bulletin. It consisted of low pressure steam heated drums, five in number, surrounding a central steam header from which the drums drew their supply of steam. The drums were accurately uniform in size, ten inches in diameter by twenty inches in length and were made of sheet metal of the kind to be tested. Steam was condensed in the drums by the cooling action of the air surrounding them and was discharged through water seals connected to each drum. These seals were U-tubes made of pipe, and were long enough to contain a water head of four feet. As the steam condensed the seals became filled with water; the condensate then dripped over into receivers as fast as it accumulated. The water in the seals cooled to room temperature before it dripped into the receivers so that evaporation was not influenced by the heat of the water in the receivers. Each receiver was mounted on a small weighing scales accurate to one one-hundredth pound.

A mercury manometer was used to obtain the pressure of the steam in the central header, and since the temperature of the steam for any known pressure may be taken directly from steam tables, it was possible to determine the temperature of the medium within the drum with great accuracy. A pressure regulator in the steam supply line held the pressure constant within a small fraction of a pound, about 0.2 pound being the variation during a test; as the temperature change for the pressure variation was negligible, the temperatures were uniform and accurate within one degree.

No thermometers were required for determining the steam temperature, but one was used in each drum at the point of outlet of the condensate to detect the presence of air in the drums. The readings of these thermometers decreased upon the formation of air pockets in the lower part of the drums or in the connected piping. Air could be blown out of small petcocks located near the thermometers in the piping. No effects on the coefficient were noticeable when steam was allowed to escape for short periods from these petcocks, which could therefore be opened during a test to discharge any small accumulation of air.

The drums were shielded from radiation from each other by blackened compo-board partitions. These partitions did not in any way interfere with the flow of natural air currents. The temperature of the air was measured by thermometers suspended at the elevation of the drums at convenient positions nearby.

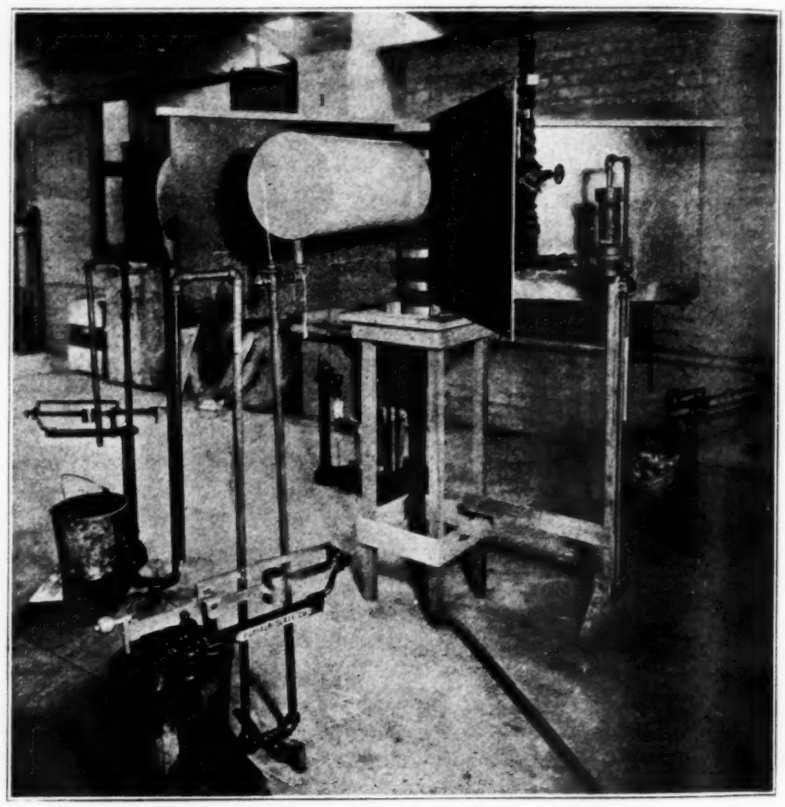


Fig. 2—Photograph Showing the Principal Operative Features of the Steam Drum Plant.

The thermometers were not affected by radiation from the drums.

Thus, the actual measurements involved were simple and were not liable to serious error. These measurements consisted of the weighing of the steam condensed, the reading of the pressure of the steam, and the reading of the room air temperature.

III. The Tests.

6. *Operation.*—The tests reported herein, forty in number, with four drums under steam in each test, were carried out at night when the doors and windows of the large laboratory were closed. No air currents were noticeable near the apparatus. A period of ten hours was chosen for the duration of a test as that time was sufficient to permit accumulations of condensate great enough to render negligible the slight error in weighing. These quantities of water varied from 5 to 20 pounds depending upon the sur-

Test N° 9 — WARM AIR FURNACE RESEARCH, ENGINEERING EXPERIMENT STATION, UNIVERSITY OF ILLINOIS — Date: 10-30-1919 — Name: W. P. Day

Subject: Steam Drum Tests of Heat Insulating Materials
Clockwise Order of Drums is N°s 2, 1, 4, 3

No.	Time	N°1 IC Tin Scales Reading (231-49)	N°1 IC Tin Weight Water	N°2 Asbestos P. Scales (231-39)	N°2 Asbestos P. Weight H_2O	N°3 3Ply Air-cell Scales (231-37)	N°3 3Ply Air-cell Weight H_2O	N°4 Paint Scales (231-32)	N°4 Paint Weight H_2O	Room T T_1 (2T4-18-3)	Room T T_2 (2T4-18-3)	Steam Press. In. Hg. Gage.
1	8:45 p.m.	8.88		11.21		4.54		2.11		80.1	80.2	1.70
2												
3	6:45 a.m.	19.78		28.38		10.00		20.24		82.3	82.5	1.70
4												
5	Diff.		10.90		17.17		5.46		18.13			
6	Evap. Correct.		+0.11		+0.11		+0.11		+0.11			
7	Total 10 Hours		11.01 lb.		17.28 lb.		5.57 lb.		18.24 lb.	81.2	81.3	1.70
8												
9												
10												
11		Air Valve Temperatures										
12			T_1		T_2		T_3		T_4			
13			2T4-18-7		2T4-18-3		2T4-18-16		2T4-18-4			
14	8:35	All valves blown 5 minutes										
15	8:41		215		212		211		212			
16	6:40 am		215		210		212		213			
17												
18												
19												
20												
21		Calculations										
22												
23		$T_{steam} - T_{air} = 215 - 81 = 134°F$										
24												
25												
26		$K_1 = \frac{971 \times 11.01}{10 \times 553 \times 134} = 1.44$ Btu/sqft/Hr/1°F for Drum N°1										
27												
28		Correction for pipe loss of 1.00 Btu										
29		$1.44 \times 553 - 1.00 = 553$ K										
30		K = 1.26 Btu/sqft/Hr/1°F										

Fig. 3—A Sample Data Sheet for a Typical Test.

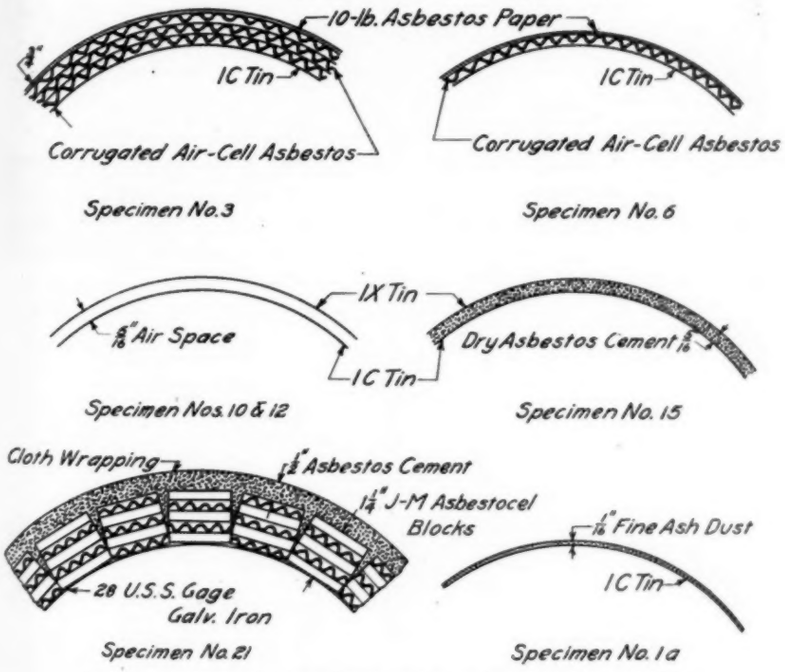


Fig. 4—Sections Showing Construction of Some of the Complex Surface Coverings.

face material of the test drums. The steam pressure was constant on any given test within 0.2 of an inch head of mercury. In all the tests there was only one case in which the thermometers indicated the presence of air in the drums at the end of ten hours operation. The greatest variation of temperature of the surrounding atmosphere during any night was four degrees Fahrenheit. A recording thermometer was used to show the uniformity of the laboratory temperature.

The drums were tested in different positions around the steam header in order to compensate for any irregularity in the flow of steam to the drums or in the currents of air about the drums. As no irregularities were noticeable in the value of the coefficients of emissivity for the various positions, the practice was abandoned after the first four drums were tested in the interchanged positions.

One drum, of bright tin not insulated, was in operation in all tests. Its performance served as an indication of any lack of uniformity in the conditions existing throughout the tests.

In order to make correction for the loss of water by evaporation from the receivers, a receiver of water was balanced on a scales and the loss in ten hours actually determined by weighing. After several trials in which the loss ranged from 0.10 to 0.12 pound it was decided to use the value 0.11 pound. This amount was applied as a correction to all the weights of water. Every test was repeated until the results obtained were found to agree within very small limits. In no case are the data reported, the result of less than two tests, and in most cases four were run. Two tests were considered sufficient if the results agreed within one per cent of their mean value.

7. *Specimens Tested.*—A complete list of the drums tested is given in Figs. 5 and 5*a*. In the list will be found a description of the insulation or the surface material, the actual area of the drum exposed to the steam, and an abstract number assigned to the drum (which will be useful in connecting the description with the results reported later in this paper). Fig. 4 shows sections through some of the insulations which were of complex construction.

IV. The Calculatinos.

In calculating the cofficients of emissivity for the various surfaces it was assumed that heat of the vapor was entirely given up, upon condensation, to the air through the walls f the containers and the connected piping. Tests on the low pressure steam-line supplying the drums show a steam quality of over 99 per cent. The expression

for the coefficient is, therefore, calculated as follows:

$$K_1 = \frac{rW}{A(t_s - t_a)} \quad \ldots\ldots\ldots\ldots (1)$$

in which, K_1 = B.t.u. per sq. ft. per hr. per 1 degree F.
r = latent heat of 1 lb. of the steam.
W = weight of condensate per hour.
t_s = temperature of the steam.
t_a = temperature of the surrounding air.
A = area of the drum exposed to the steam.

Correction must be made for the loss of heat through the half-inch pipe of which the water seal was made. This loss is not accounted for in the calculation for K_1 above. Three lineal feet of the half-inch pipe were exposed to the steam. The correction is made by using a coefficient of emissivity for this pipe of 2.50 B.t.u. per square foot per hour per 1 degree Fahrenheit and the exposed area of 0.375 square feet, or, 2.50×0.375 = approximately 1.00 B.t.u. per hour per 1 degree Fahrenheit to be subtracted from the heat loss, or

$$AK_1(t_s - t_a) - 1.00(t_s - t_a) = AK(t_s - t_a)$$

$$\text{and } K \text{ corrected} = \frac{AK_1 - 1.00}{A} \quad \ldots\ldots\ldots\ldots\ldots (2)$$

This correction was verified by tests made on the drums with the water seals heavily insulated with hair felt. The values of K so determined agree closely with the values obtained by applying the correction.

Fig. 3 is a copy of a test data sheet and shows all readings and calculations for one test.

V. Results of the Tests.

8. *Discussion.*—The significance of the tests will be best understood by a study of the information presented in the diagrammatic chart, Figs. 5 and 5*a*. The heavy black bars afford a graphic comparison of the heat emitting value of the various surfaces. Reference must be made to the descriptive list of drums in order to connect the data with particular test specimens. The relative efficiencies of the various surfaces as heat insulators are given in the next to the last column of the chart. The coefficient for bright IC tin was used as the basis for this comparison.

The first result of importance is the convincing evidence which the tests present as an argument against the use of thin layers of asbestos paper covering on bright tin pipes. The heat loss was 39 per cent greater with one thickness of the paper than without. Such a loss is of no small degree of importance as calculations will show that it results in a waste of 5 per cent or more of the coal consumed in the average house furnace.

The fact that the heat loss from the warm-air pipes of a furnace system is of some consequence is not appreciated generally. A considerable part of the heat of the air flowing through the pipes of the average installation is dissipated from the pipe surface to the surrounding air and nearby objects. The insert in Fig. 6 sets forth the results of tests made to determine the amount of this loss. The tests were carried out on a single leader pipe furnace, see Fig. 6, in which the quantity of air handled and the heat content of the same above the entering temperature could be readily ascertained. The heat loss was determined by calculation from the drop in temperature of the air in its passage through the pipe. The temperature and velocities indicated in the curves are fair representative values.

The significance of these preliminary tests is to bring out the fact that the heat loss from warm-air furnace pipes is a serious item. From the curves, it can be seen that in the case of the asbestos paper-covered pipes, the loss amounts to about 23 per cent of the heat of the air at the bonnet, above inlet air temperature. If the pipe is of bright tin and not covered, this loss is reduced to about 17 per cent of the heat available. In either case the loss is great; and with the further consideration that a warm-air furnace under average conditions of installation is, at best, only about 60 per cent efficient, it will be understood that the actual waste of coal ascribable to poor heat pipe insulation is enough to warrant attention.

The attempt was made in the steam drum tests to determine the effect upon the heat loss of having the drum partly enclosed so that free circulation of the air about the drum would be prevented. The experiment simulated the effect of running leader pipes between joists. The results of these tests as shown in No. 14 and 14*a* indicated a slight decrease in the value of K for the enclosed drum.

The argument has been advanced that if bright tin pipes were used without covering, they would soon become fouled with dirt and dust and so rendered less efficient heat carriers than asbestos paper covered pipes. The fallacy of this argument is revealed by tests No. 1*a* and No. 16*a*. In these thests fine ash dust was sifted on the test drums, one of bare bright tin and the other asbestos paper covered. The dust was more than one-sixteenth inch deep on top of the drums. The results as shown in tests No. 1*a* and No. 16*a* of the chart indicate that the bare tin suffered a loss of 11 per cent in efficiency whereas the asbestos paper surface improved 2.4 per cent. There still remained, however, a difference of 25 per cent in favor of the bare tin pipe.

In order to demonstrate further the inefficacy of thin layers of asbestos paper as a heat insulator, tests were run in which the number of thicknesses of paper was increased until the heat loss became less than the loss through a bare bright tin specimen. The curve (Fig. 7) gives the results of these tests. Eight thicknesses of the twelve-pound paper were applied before the desired result was obtained. In these tests the moistened paper was wrapped tightly and shrunk on the drums so that only a small quantity of air was entrapped between the successive layers of paper. The total thickness of paper was two-tenths of an inch. The impractical features of such a method of insulating are of course evident. The use of thin layers of asbestos paper on bright tin pipes must be abandoned if the best results are to be obtained in furnace heating.

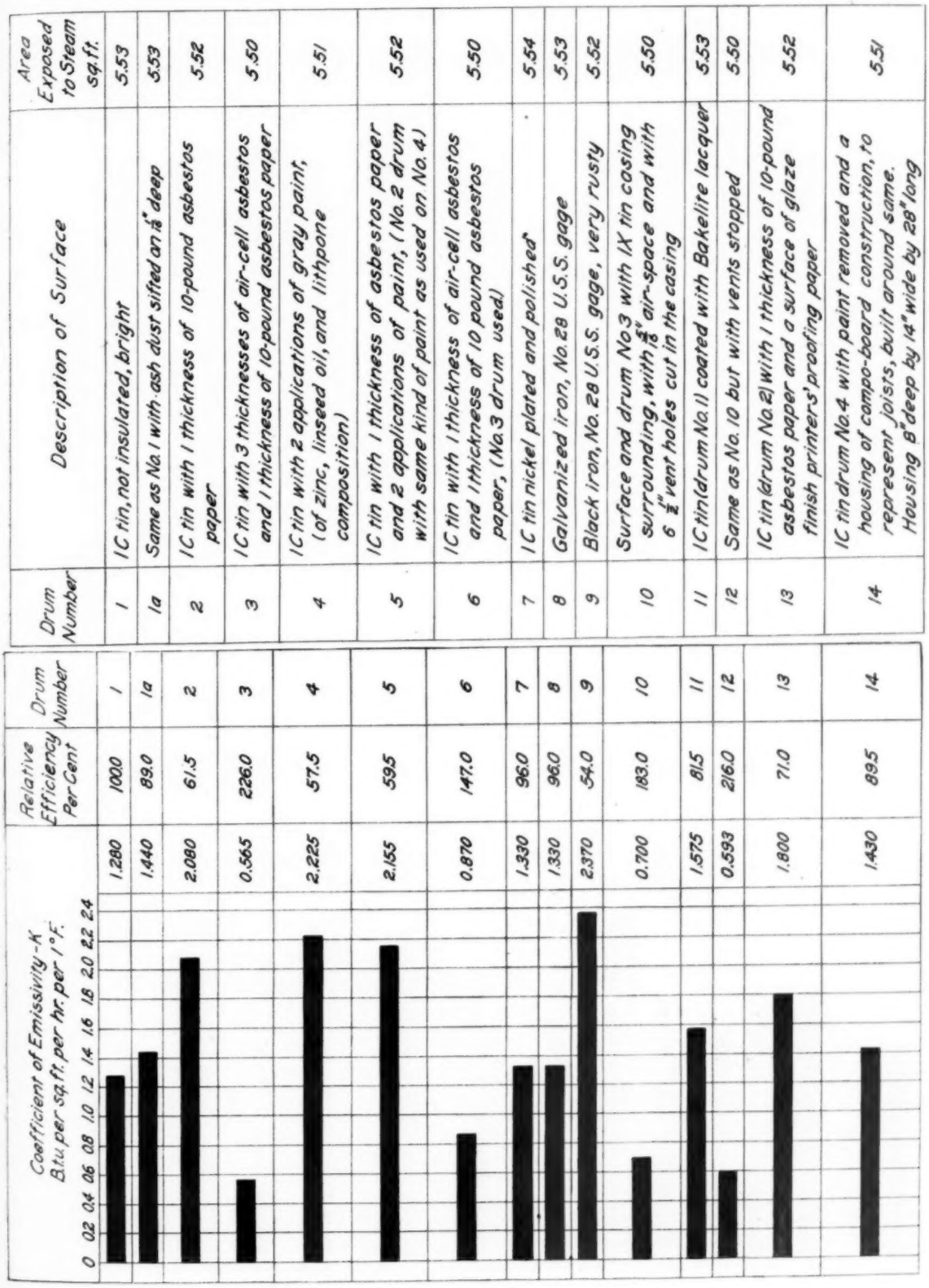
Other materials of better heat insulating value than the bare tin were tested. Numbers 3, 6, 10, 12, 15, 18, and 21, all show values which indicate that a large saving would be effected by their use. Some of them are expensive and not easy of application, but good selections may be made. The air-cell combinations Nos. 3 and 6 are excellent insulators, are easy to fit to basement leaders, are not expensive, and the latter in particular, is not bulky.

The double wall tin pipes Nos. 10 and 12 are very efficient insulators and are easy to construct and to install. Other tests are in progress which are expected to establish still further the merits of this type.

The tests on galvanized iron specimens brought out the fact that the heat loss through this material is not greater than through bright tin of the same gage. This low heat radiating property is an argument in favor of the galvanized iron leader pipe. Nos. 18 and 21 are good insulations for the exterior of furnace casings, the heat loss through the latter being almost negligible. No. 21 is very easily applied.

The tests on drum No. 11 were made to determine the effect of transparent applications on the tin surface. Bakelite lacquer was used. The result was a slight increase in the heat loss. It was thought that the use of the lacquer would be justified in practice by its rust preventing qualities, but specimens exposed to steam laden air for long periods show no advantage for the protective coating.

Tests Nos. 20 and 23 were made for the purpose of ascertaining the effect of color upon the heat radiating value of a surface. Applications of white calcimine were made on a drum which was tested; then a



Drum Number	Description of Surface	Area Exposed to Steam sq.ft.	Coefficient of Emissivity-K Btu per sq.ft. per hr. per 1°F.	Relative Efficiency Per Cent	Drum Number
1	IC tin, not insulated, bright	5.53	1.280	100.0	1
1a	Same as No. 1 with ash dust sifted on ⅛" deep	5.53	1.440	89.0	1a
2	IC tin with 1 thickness of 10-pound asbestos paper	5.52	2.080	61.5	2
3	IC tin with 3 thicknesses of air-cell asbestos and 1 thickness of 10-pound asbestos paper	5.50	0.565	226.0	3
4	IC tin with 2 applications of gray paint, (of zinc, linseed oil, and lithpone composition)	5.51	2.225	57.5	4
5	IC tin with 1 thickness of asbestos paper and 2 applications of paint, (No. 2 drum with same kind of paint as used on No. 4)	5.52	2.155	59.5	5
6	IC tin with 1 thickness of air-cell asbestos and 1 thickness of 10 pound asbestos paper, (No. 3 drum used)	5.50	0.870	147.0	6
7	IC tin nickel plated and polished	5.54	1.330	96.0	7
8	Galvanized iron, No. 28 U.S.S. gage	5.53	1.330	96.0	8
9	Black iron, No. 28 U.S.S. gage, very rusty	5.52	2.370	54.0	9
10	Surface and drum No. 3 with IX tin casing surrounding, with ½" air-space and with 6 ½" vent holes cut in the casing	5.50	0.700	183.0	10
11	IC tin (drum No. 1) coated with Bakelite lacquer	5.53	1.575	81.5	11
12	Same as No. 10 but with vents stopped	5.50	0.593	216.0	12
13	IC tin (drum No. 2) with 1 thickness of 10-pound asbestos paper and a surface of glaze finish printers' proofing paper	5.52	1.800	71.0	13
14	IC tin drum No. 4 with paint removed and a housing of compo-board construction, to represent joists, built around same. Housing 8" deep by 14" wide by 28" long	5.51	1.430	89.5	14

Fig. 5—Diagrammatic Table of the Results of One Hundred and Sixty Tests on Steam Drums.

coat of dull black calcimine was added and the drum re-tested; a final coating of white calcimine was applied and the drum again tested. The alternate tests with white calcimine checked very closely proving that the additional thickness of the calcimine was not heat loss caused by painting bright tin heat pipes, and a comparison of Nos. 2 and 5 will show the similar wasteful effect of painting over the asbestos paper covering. However, the use of paint on asbestos paper has in its favor the moisture-proofing effect of the

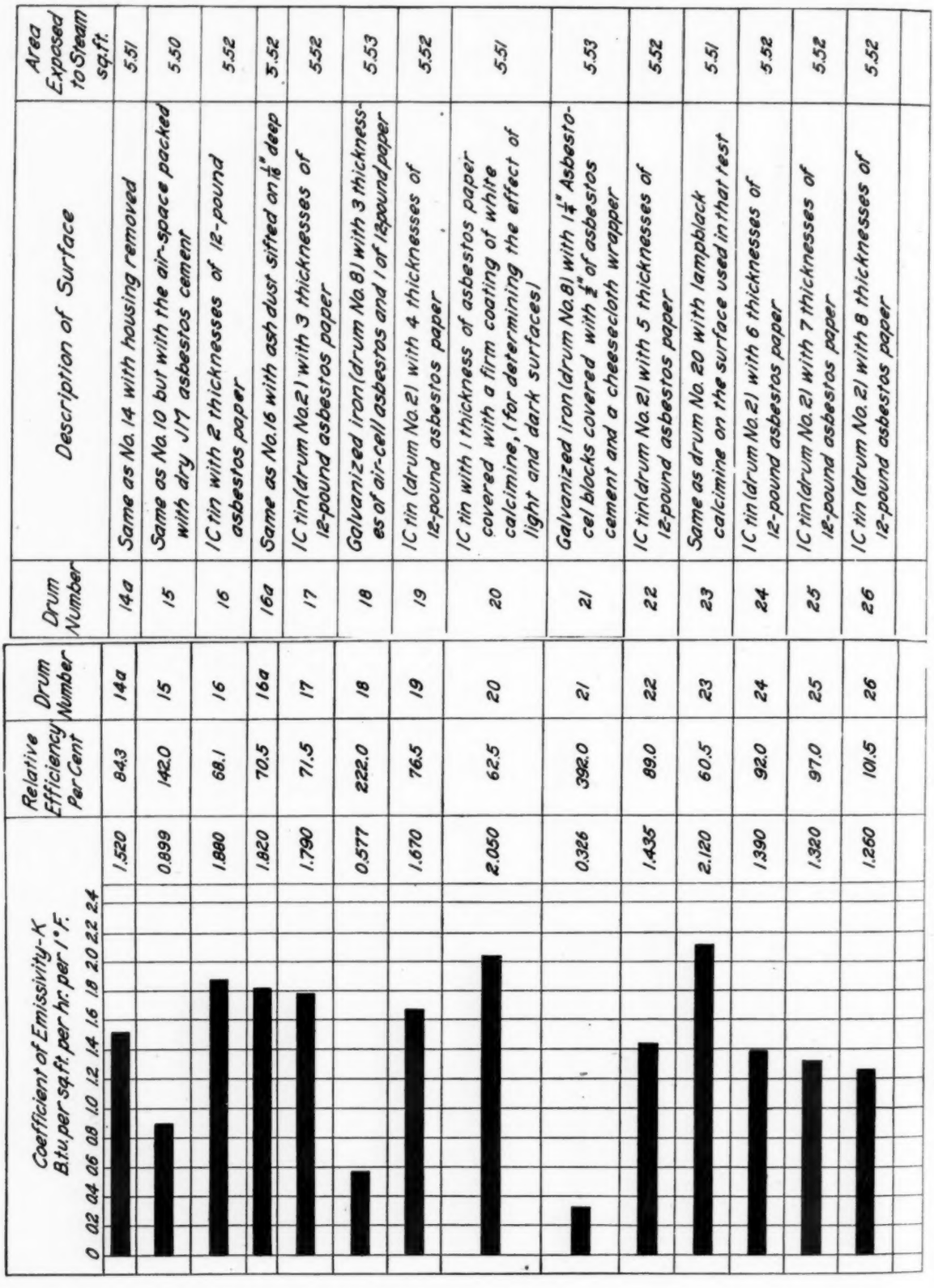

Coefficient of Emissivity-K B.t.u. per sq.ft. per hr. per 1°F.
0 .02 .04 .06 .08 .10 .12 .14 .16 .18 .20 .22 .24
Relative Efficiency Per Cent
Drum Number
1.520 843 14a
0.899 142.0 15
1.880 68.1 16
1.820 70.5 16a
1.790 71.5 17
0.577 222.0 18
1.670 76.5 19
2.050 62.5 20
0.326 392.0 21
1.435 89.0 22
2.120 60.5 23
1.390 92.0 24
1.320 97.0 25
1.260 101.5 26
Drum Number
Description of Surface
Area Exposed to Steam sq.ft.
14a Same as No. 14 with housing removed 5.51
15 Same as No. 10 but with the air-space packed with dry 1/4 asbestos cement 5.50
16 IC tin with 2 thicknesses of 12-pound asbestos paper 5.52
16a Same as No. 16 with ash dust sifted an 1/8" deep 5.52
17 IC tin (drum No. 21 with 3 thicknesses of 12-pound asbestos paper 5.52
18 Galvanized iron (drum No. 8) with 3 thicknesses of air-cell asbestos and 1 of 12-pound paper 5.53
19 IC tin (drum No. 21 with 4 thicknesses of 12-pound asbestos paper 5.52
20 IC tin with 1 thickness of asbestos paper covered with a firm coating of white calcimine, (for determining the effect of light and dark surfaces) 5.51
21 Galvanized iron (drum No. 8) with 1 1/4" Asbestocel blocks covered with 1/4" of asbestos cement and a cheesecloth wrapper 5.53
22 IC tin (drum No. 21 with 5 thicknesses of 12-pound asbestos paper 5.52
23 Same as drum No. 20 with lampblack calcimine on the surface used in that test 5.51
24 IC tin (drum No. 21 with 6 thicknesses of 12-pound asbestos paper 5.52
25 IC tin (drum No. 21 with 7 thicknesses of 12-pound asbestos paper 5.52
26 IC tin (drum No. 21 with 8 thicknesses of 12-pound asbestos paper 5.52

Fig. 5a—Continuation of the Diagrammatic Table of the Results of One Hundred and Sixty Tests on Steam Drums.

sufficient to have any bearing on the results. Beyond demonstrating the superior radiating value of a dark surface, the tests have little significance.

Specimens Nos. 4 and 5 demonstrated the uneconomical effect due to increased heat loss of any kind of oil paint applications on heat pipes. A comparison of Nos. 1 and 4 will show the enormous increase in paint.

Other information of value may be found in the data given in the table. To use these data for the determination of the approximate heat loss from a heat pipe, it is only necessary to multiply the value of *K* for the surface by the surface area of the pipe exposed and further multiply by the difference in tem-

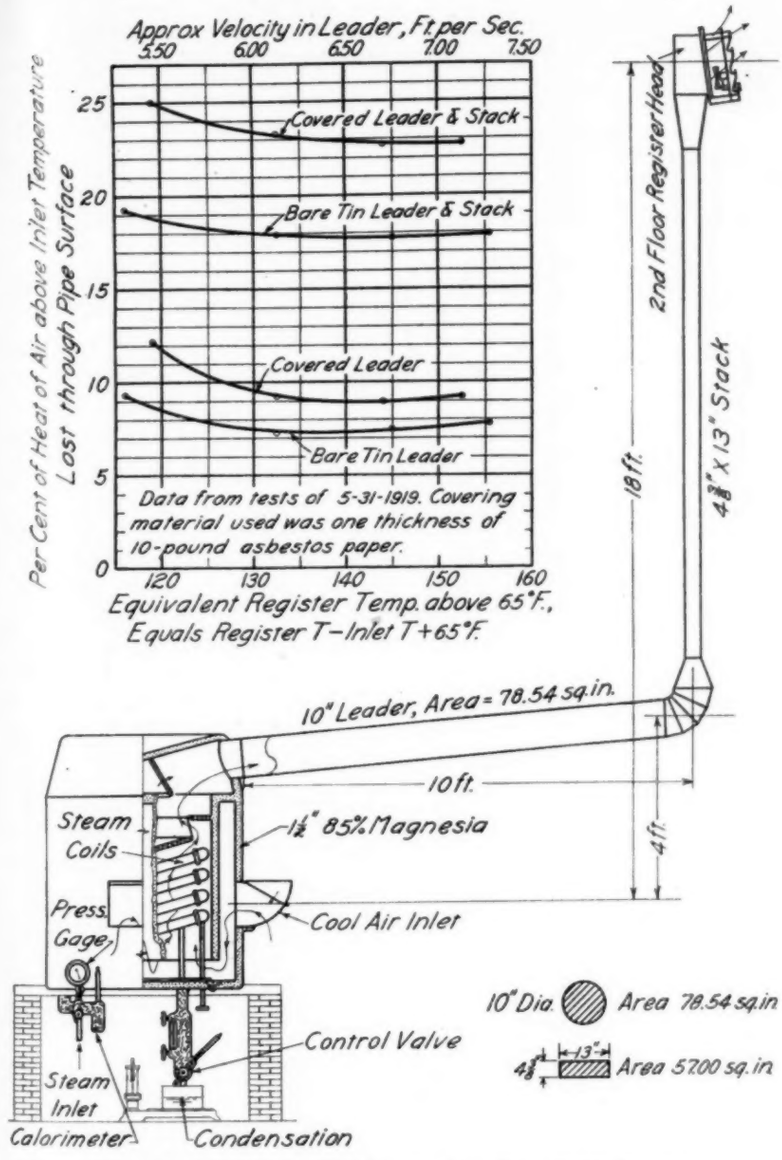


Fig. 6—Elevation of Auxiliary Furnace Plant With Insert Showing Percentage of Heat Lost From Covered and From Bare Bright Tin Pipes.

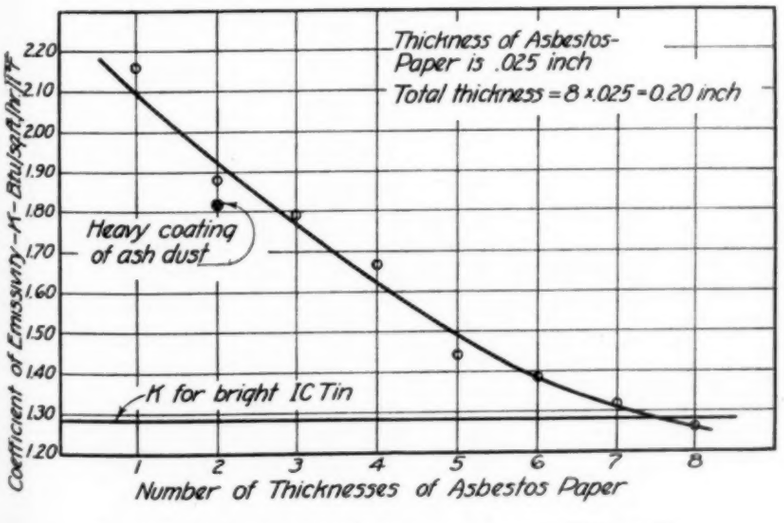


Fig. 7—Curves Showing Ineffectiveness of Commercial Asbestos Paper for Insulation of Bright Tin Pipes.

perature between the air inside and outside the pipe, or, B. t. u. loss per hour =

$$K \times \text{Area in sq. ft.} \times (t_1 - t_a)$$

On account of the difficulty of correctly measuring the temperature of the air near the inner surface of the pipe, the method of determining the loss from a pipe as here given, is only approximate.

VI. Corroborative Tests.

9. *The Auxiliary Air Plant.*—In order to show the connection between the work done on the steam drums already described and conditions obtaining in a warm-air system, the following account of experiments conducted on the Auxiliary Furnace Plant which is shown in Fig. 6 of this bulletin is given. In these experiments, the weight of air flowing up the pipe was determined by the use of the steam-air meter which supplied the heat. Half way along the ten-foot length of the ten-inch leader pipe was located a traversing device (Fig. 8) which made it possible to get temperatures at any point across the pipe diameter by intervals of one-hundreds of an inch. A thermocouple was used in the traverse and its readings were accurate within one degree Fahrenheit. A second couple was tinned to the surface of the pipe and by rotation of the pipe (a short section could be turned) temperatures at any point on the surface in the plane of rotation of the couple could be determined.

10. *Temperature Measurement.*—The couples used in this work were made of copper and constantan wires of No. 22 gage. The junctions were silver soldered. Fig. 8 shows the wiring arrangement and the instruments used for two couples. As many couples may be used as there are contact point on the selector switch. Four were used on the leader pipe for the tests here described. The couples were calibrated individually in a hot oil bath over a range of 200 degrees, and calibration curves were carefully drawn. It is possible to repeat readings of the pyrovolter within 0.01 millivolt which by calibration is 0.4 defree Fahrenheit. This insures an accuracy of reading of one-half degree. As the couples were soldered to the surface of the pipe in some parts of the work, it was thought advisable to repeat the calibration after the couples were removed from the pipe. The constancy of the couples was found to be unaltered by the soldering to the pipe. The use of thermometers for accurate temperature measurements in an air stream is not satisfactory. Thermometer readings will not be in agreement with thermocouple readings though both are suspended in close proximity in the same stream of moving air. For this reason thermocouples were used

throughout these tests.

In Fig. 9 are given temperature traverse curves showing the variation in temperature across the ten-inch pipe. Curves are shown for both the asbestos paper-covered pipe and the tests being identical. The curves demonstrate the heat-radiating value of the asbestos paper. Note that not only the air temperature but the surface metal temperature beneath the paper is lower in the case of the covered pipe, this fact indicating that the tin in conducting the heat to the asbestos covering which in turn radiates it more rapidly than does uncovered tin. Very exact means were taken to determine the temperature of the film of air in contact with the inner surface of the pipe. The traversing couple, made of wire 0.025 inch in diameter, was filed flat at the junction so that it was less than 0.02 inch thick. Measurements of the temperature were made with this thin couple at a distance from the pipe surface just great enough to cause a break in an electric circuit through the couple and the pipe, the break being indicated by a small voltmeter in the circuit. The distance was less than 0.01 inch from the pipe surface. The temperatures were found to differ from the metal temperature 15 to 30 degrees, the greater difference existing in the case of asbestos paper-covered pipe. (See the sample data sheet Fig. 10 for data on these measurements.)

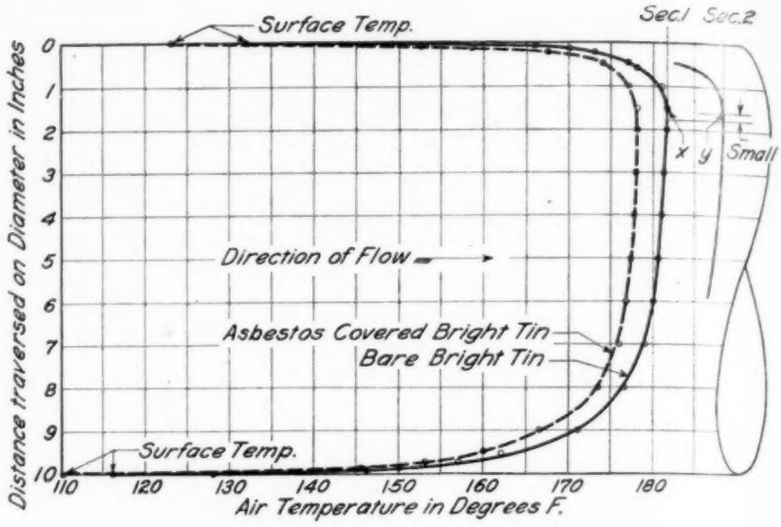


Fig. 9—Temperature Traverse Curves of Ten-Inch Leader Pipe.

The temperature change of the air flowing in the pipe was determined by the use of couples suspended in the air stream 3 inches below the top of the pipe. These couples correctly register the temperature drop of the mass of air between any two sections for the reason that the traverse curves are similar in shape at all sections along the pipe, and the error in reading the temperature due to a difference in the traverse curve is very slight. This fact is illustrated in Fig. 9 at Sec. 1 and Sec. 2. It will be seen that a great difference in the shape of the traverse curve would be necessary to cause serious error in determining the temperature drop along the path of flow of the air.

In measuring the temperature of the pipe surface, it was found that, whereas the air in the pipe dropped in temperature, the pipe itself showed a measurable increase in temperature away from the furnace. This slight increase occurred when the pipe was covered as well as when bare. As this increase amounted to only about 3 degrees and was proportional to the length of pipe, it was considered permissible to use the temperature half way up the leader as the mean metal temperature.

11. *Calculation.*—The coefficient of emissivity for the pipe surface may be calculated since the heat loss through the surface of the pipe between any two sections is equal to the decrease in the heat content of the air in its passage through the length of pipe between the two sections, or,

$$0.24\,W\,(t_1 - t_2) = A\,(t_s - t_a)\,K_1 \quad \ldots\ldots(3)$$

in which W is the weight of air flowing.

$t_1 - t_2$ = the temperature drop of the air in the given length of the pipe.

posed in the given length of pipe.

A = the area of the pipe ex-

$t_s - t_a$ = the drop in temperature between the metal of the pipe and the air.

K_2 = the cofficient of emissivity not corrected.

Solution of the equation will furnish a value for K_2, which will not, however, check or agree with the value determined in the steam drum tests of the same material. The variation may be easily explained since it is a well-established law that the coefficient of heat emissivity of a hot body varies with the temperature difference between the heating and the cooling medium. (See tests

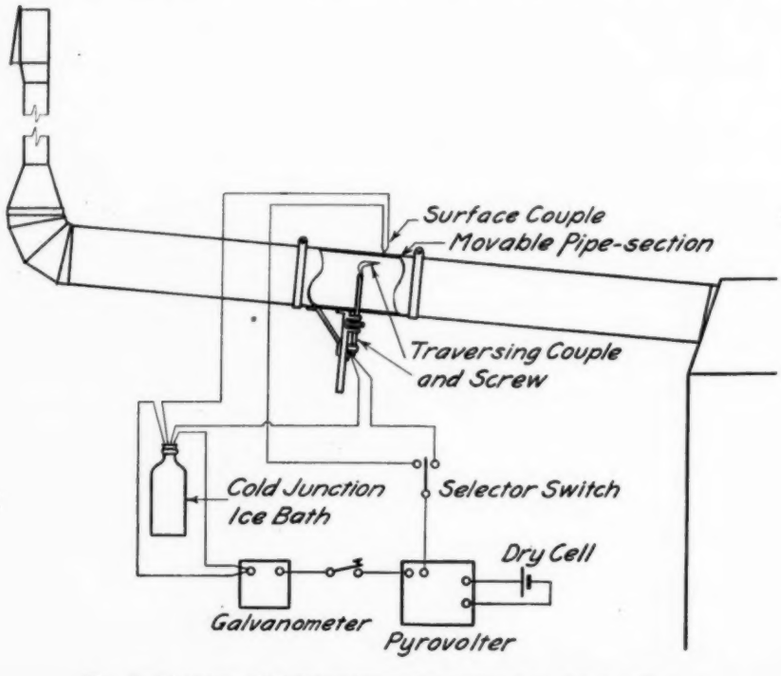


Fig. 8—Diagram of Thermocouple Connections to the Auxiliary Testing Plant.

of radiators by J. R. Allen which demonstrate this fact.)

In the case of the heat pipe the temperature traverse showed a low air temperature near the inner surface of the pipe and also a correspondingly low temperature of the metal of the pipe. The result is a comparatively low value of $t_s - t_a$ and according to the law, a low coefficient is to be expected.

The following case will illustrate: The pipe was covered with 12-pound asbestos paper. The surface couple showed that the temperature of the tin beneath the paper was actually lower than the temperature in the case of a bare pipe.

$$W = 479$$
$$t_1 - t_2 = 17$$
$$t_s - t_a = 44$$
$$A = 26.40$$
$$K_2 = \frac{479 \times 0.24 \times 17}{44 \times 26.40} = 1.77$$

B.t.u. per sq. ft. per hr. per 1 degree F.

Assuming that the correction of 0.2 per cent per degree Fahrenheit below the standard range of 150 degrees which is used in making corrections with direct radiators applies to this surface, the value of K becomes:

$$K_2 = K - 0.002\,K\,[150 - (t_s - t_a)]$$
$$1.77 = K\,[1 - 0.002(150 - 44)]$$
$$K = 2.24 \text{ B.t.u. per sq. ft. per hr. per 1 degree F.}$$

This result is in close agreement with the value of $K = 2.08$ as determined in the steam drum tests and reported above.

WARM AIR FURNACE RESEARCH
ENGINEERING EXPERIMENT STATION
UNIVERSITY OF ILLINOIS

Date 2-17-1920
Name W. P. Kratz

Auxiliary Plant
Subject: Temperature Traverse Test of 10" Leader.
10"x10' Leader not covered, & 42"x13"x14' Stack

No.	Time	Traverse	Thermocouple Position	Thermocouple Reading	Thermocouple Temp. °F	Room T °F	Air Temp. Couple Reading	Air Temp. Temp. °F	Metal Temp. Couple Reading	Metal Temp. Temp. °F	Weight Time	Weight Scales
1			Contact									
2		Traversing Upward	.01	2.89	156	68	At Bonnet		At Bonnet		1:55	3.68
3			.06	3.10	164		3.70	187	2.06	122.5	2:55	28.62
4			.11	3.16	166						Diff.	24.94
5			.21	.25	169.5						St. Press.	137 Lb.
6			.26	.28	170.5		At 2 Ft. Out		At 2 Ft. Out		Barometer	= 29.60 "Hg.
7			.36	.29	171		3.66	185	2.10	124		
8			.56	.35	173.5							
9			.76	.39	174.5							
10			.96	.42	176		At 5 Ft. Out		At 5 Ft. Out			
11			1.46	.51	179		3.60	183	2.12	125		
12			1.96	.51	179							
13			2.46	.56	181							
14			3.46	.57	181.5		At 8 Ft. Out		At 8 Ft. Out			
15			3.96	3.59	182	68	3.49	179	2.14	126		
16			Contact									
17		Traversing Downward	.01	3.10	162	68						
18			.06	.29	171		At Boot		At Boot			
19			.11	.34	173		3.42	176				
20			.21	.47	178							
21			.26	.49	178.5							
22			.36	.55	180.5							
23			.56	.58	181.5							
24			.76	.63	183.5							
25			.96	.66	185							
26			1.46	.66	185							
27			1.96	.67	185.5							
28			2.46	.65	184.5							
29			3.46	.65	184							
30			4.46	3.64	184	68						

Weight Air per Hr. by Steammeter
$\frac{(1188 + 32 - 340) \times 0.95 \times 24.94}{0.24 \times (187 - 68)} = 730$ Lb.

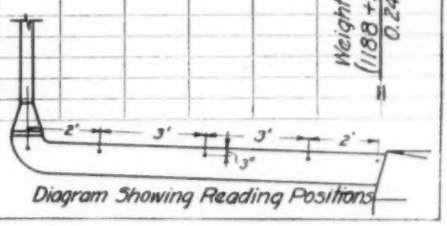


Diagram Showing Reading Positions

Fig. 10—Data for a Temperature Traverse Test on the Auxiliary Furnace Testing Plant.

12. *Conclusion.*—Enough tests have been made on this apparatus to entirely corroborate the results obtained on the steam drums, and additional tests are in progress in which more exacting methods are employed.

The second paper of the report of the warm air furnace Research staff, University of Illinois, was by A. P. Kratz, Research Assistant Professor Mechanical Engineering Department. His subject was "Humidity Data for Furnace Heating with Various Types of Water Pans," and treated of (a) laboratory tests with three types of pans, and (b) humidity conditions in a house installation with and without humidity pans.

The need of accurate humidity data for the various types of water pans in furnaces is quite obvious.

At the conclusion of the scholarly paper by Professor Kratz, the morning session of the Convention adjourned for luncheon which was served in an adjoining room.

The afternoon session began at 2 o'clock with the reading of a paper on "Kerosene as a Fuel," by A. B. Frenier of Chicago, Illinois. The salient paragraphs of his address are as follow:

Address on "Kerosene as a Fuel" by A. B. Frenier, of Chicago, Illinois, Delivered April 21, 1920, to the Seventh Annual Convention of the National Warm Air Heating and Ventilating Association, in Hotel Cleveland, Cleveland, Ohio.

On approaching the subject "Kerosene as a Fuel," it would appear at first thought more presumptuous than otherwise to be able to add anything new or even interesting to the volumes that have been written on oil as a fuel or the substitution of liquid fuel for hard fuel.

However, those who have been interested in this subject and have had occasion to study these records have undoubtedly observed that the great mass of data heretofore recorded pertains almost exclusively to the burning of liquid fuel in connection with power plants or for industrial purposes generally, and that very little, if anything, has been recorded of the burning of liquid fuel in connection with the heating of homes or other domestic use. It is to the burning of kerosene or other hydro-carbons as a fuel in the heating of homes that the present discussion will be more particularly directed.

Liquid Fuel for Heating Homes.

Let it be understood at the start that the burning of liquid fuel for the heating of homes is a vastly different problem than the burning of liquid fuel for industrial purposes. In the heating of homes, these problems are much more numerous, varied, and far more difficult, and that so comparatively little has heretofore been accomplished in the substitution of liquid fuel for hard fuel in the heating of homes can, in my opinion, be attributed solely to these numerous increased difficulties.

The successful liquid fuel burner in the home must, in the first place, be reasonably quiet in its operation. We can not have the roar of the factory in the basement of the home. It must be of simple, durable, and rugged construction—must endure for the life of the furnace. It must be dependable and absolutely automatic in its operation. It

must function perfectly without an attendant. It must meet the rigid requirements of the Fire Underwriters. It should decrease and certainly not add to the fire hazard. It must be reasonable in cost. It must adapt itself to existing heating plants without physical change thereof.

Present-Day Method of Using Liquid Fuel.

The present day methods and means resorted to in burning liquid fuel, confined as above stated to industrial purposes chiefly, wherein atomizing is accomplished by high pressure air, steam, or high pressure on the fuel, with its attendant roar and noise; and wherein the services of an attendant are constantly required; and wherein automatic controls are practically impossible; and wherein specially designed boilers, furnaces, or heat producing elements must be provided—teach us little or nothing in the production of a house heating burner stamped by the characteristics just mentioned.

Is it possible to construct a liquid fuel burning device that will meet all these requirements? I am glad to say that such a device can and is being manufactured on a commercial basis.

As practical conditions are so inseparably connected with chemical principles in the solution of the liquid fuel problem, a description of the construction and methods of operation of the device in question must not be looked upon as a digression from the subject assigned me, but as we proceed it will be seen to serve as an excellent illustration by which more to readily grasp the problems involved in the burning of heavy hydro-carbons.

In discussing this subject, the theory of combustion will be entered into only to an extent necessary to a proper appreciation of the problems encountered in the adaptation of the liquid fuel burner to the heating of homes and a better understanding of the mechanism employed, and the functioning thereof.

Kerosene or other heavy hydro-carbons, non-volatile at normal temperatures, will not burn in the liquid form.

Kerosene Will Not Burn in Liquid Form.

If a blazing stick, a flaming saturated rag or bunch of waste, or a live coal be dropped or thrust into a vessel containing such liquid, the flame would be extinguished or the live coal quenched. The explanation lies in the fact that the oil is vaporized so slowly that the inflammable gas produced is insufficient to support continuous combustion. To support continuous combustion the liquid fuel must either be changed from its liquid form to a gaseous state by the application of heat before ignition or it must be atomized or broken up into a fine spray or mist.

Disadvantages of Vaporizing Method.

Both methods possess certain advantages as well as disadvantages, depending in a great measure upon the use to which it may be put. The former method, that of gasifying or more generally known as vaporizing, has heretofore had the distinct advantage of practically complete combustion and in the production of and concentration of relatively high temperature in an exceedingly small space. However, this conversion of the liquid to a gas necessitates the application of heat, and the subjecting of the liquid to great pressure so that the gas upon entering the usual funnel-like mouth of the burner can aspirate or draw in the requisite amount of air to effect proper combustion. The disadvantages of the vaporizing method lie principally in the early "cooking up" of the retort or that portion of the fuel line subjected to heat for gasifying, and also in the complications and real dangers incident to the carrying of high pressure upon the fuel line. It is this application of heat and high pressure that renders the vaporizing system of liquid fuel burning unfit, in fact prohibitive, for use in connection with the heating of homes.

Discusses Nature of Combustion.

Atomizing the fuel by the use of the usual means of high pressure air, steam, or fuel pressure, with the resultant large mass of roaring non-controllable flame, would be equally unfit for domestic use, but as will be disclosed presently, it is possible to properly atomize and maintain perfect control of the flame without the application of an ounce of pressure.

What is combustion? I know of no better statement of the meaning of combustion than that given by Mr. Morgan B. Smith before the Heating and Ventilating Engineers at their Pittsburgh meeting last June. He said, "By combustion we mean the rapid union of the combustible matter of fuel with oxygen obtained from air. When air is brought into contact with combustible matter at a sufficiently high temperature, rapid union takes place, the combustible being oxydized with the liberation of heat. Perfect combustion takes place when the combustible units with the greatest possible amount of oxygen. In the case of carbon this is true when it burns to form the gas known as carbon dioxide CO_2 gas. Imperfect combustion takes place when the combustible unites with less than the greatest amount of oxygen, in the case of carbon, when it burns to form carbon monoxide or CO gas. Perfect combustion is what we desire for then we utilize fully all the heat stored up in the fuel. If combustion is imperfect, we do not utilize all the heat."

One pound of carbon burned completely in air forming CO_2 gas liberates 14,500 British Thermal Units while it will liberate only 4,400 British Thermal Units when burned incompletely forming CO gas.

What then are the essential requisites with respect to the physical and mechanical features of a successful liquid fuel burning apparatus for house heating purposes?

In this report it is stated that with a charcoal or coke fire, it is possible to maintain intense combustion within a comparatively small space with little smoke. This sort of fire was known to the smelters of the Bronze Age and it is still used in some blast furnaces and other operations where great concentration is required. The explanation lies in the fact that the fuel is solid even at the highest temperature, and as a result of this solidity, no carbon can leave the bed of hot coals except as a constituent of CO or CO_2. If the carbon goes up the stack as a constituent of CO, it carries with it two-thirds of the heat that it is primarily capable of yielding up, and it is only with respect to the possible formation of CO instead of CO_2 that a charcoal fire fails to give perfect results. Were it not for this possibility, there would be no reason why a charcoal fire should need more space than is sufficient to contain the fuel itself. The formation of CO in the flue gases is prevented by supplying the proper quantity of air through the bed of coal. It is known, however, that if the amount of oxygen passing through the burning coal is twice that requisite for the complete combustion of carbon, there is still some of the carbon that leaves the furnace in a partly burned condition, owing to improper diffusion of the gases. The only way in which this carbon can be completely burned is by subsequent diffusion of the gases whereby each molecule of CO sooner or later meets with an atom of free oxygen and so becomes CO_2. But this diffusion requires time and as the gases are being constantly cooled as they are carried along, it may easily happen that they will be cooled below the ignition temperature before union takes place. Thus, large commodious combustion chambers, or fire boxes must be provided for the burning of hard fuel. As complete combustion requires that for every atom of carbon there shall be two atoms of oxygen brought in close proximity and that then and there the carbon subjected to a temperature sufficient for ignition, there must be a thorough mixture and then ignition. The difficulty lies in the making of a mechanical mixture that would ever be perfect enough to bring about the desired result. The mechanical mixture usually produced is a kin to the smoky combustion of black gun powder, wherein the mixture is formed mechanically as compared with the combustion of smokeless powders where there is a chemical mixture with similar proportions of oxygen, carbon and hydrogen occurring in each separate molecule. The more thorough and complete the diffusion and prompt rise of temperature to the ignition point, the closer do we approach the chemical mixture of the smokeless powder. At ordinary temperatures, the particles of oxygen in the air are moving in every conceivable direction, with velocities averaging over 1,600 feet per second. Any one atom, however, moves only an inappreciable distance before being arrested by collision with another atom, so that although the average velocity of the atoms is probably equal to that of a rifle ball, it still takes an appreciable time for a particle to travel even a moderate distance. It is this time element that constitutes the great stumbling block when the attempt is made to burn a large amount of combustible in a small space. Intense combustion is easily attained with a charcoal fire by reason of the fact that the fuel remains solid at the temperature of ignition. It thus presents a large surface for the oxygen to act upon, and an atom can not break away and go up the chimney without at least being united with an atom of oxygen. In the combustion of liquid fuel, however, the fuel is already on its way to the chimney before it is even partly burned; that is, when burned in the ordinary present day devices. The first effect of heat is to separate the carbon from the hydrogen, and should there be carbon left alone, it is much less favorably circumstanced than that in a charcoal fire. If it can attach itself to a hot coal capable of receiving a blast of air, its combustion would be easily accomplished, but instead of this, it is carried along by the current of gases, and unless it is given plenty of time before being cooled, it will be left alone as a particle of soot.

This is well illustrated by the ordinary luminous flame. The luminous part of the flame is caused by the white hot particles of carbon. These particles have been robbed of the hydrogen but have not yet met the oxygen necessary for complete combustion. This process of finding or being found by the oxygen requires time, and if the temperature falls below that of ignition before the process is completed, the carbon will be deposited as soot or goes on up the stack as smoke along with the excess oxygen with which it should have been united.

In the burning of coal or oil as commonly practiced, proper diffusion to complete combustion take place subsequently to the formation of CO if at all, and as pointed

out, if the furnace temperature is less than that necessary to keep the rapidly moving particle or atom of CO at ignition temperature, it will pass off as CO.

Incandescently hot walls not only hasten the process of diffusion but prevent the cooling off of the gases below ignition point. Where it is possible for the diffusion to be completed before combustion begins, the difficulties naturally disappear and there is rapidly attained a comparatively short flame, which moreover is incapable of depositing soot, even on a cold body. If, therefore, a liquid fuel burning device were constructed in which the walls of the combustion chamber were walls of flame and diffusion were well developed if not entirely completed before the beginning of combustion, we would be fast approaching a mixture akin to the chemical mixture of the smokeless powder.

Describes Kerosene Burning Device.

The burner which I am describing consists of a substantial cast iron combustion chamber 8 inches square, 4 inches deep, open at the top. The floor and wall 5/8 inches thick. A baffle in the form of a flange extends inwardly from all sides, at the upper edge of the walls. It is connected by an air pipe to a motor driven fan or blower. The fan is of sirocco type, 6 inches in diameter and 1 inch face. The combustion chamber end of the air pipe enters an air venturi and fuel nozzle assembly, which is secured to the outside of the combustion chamber with the air venturi extending into and part way across it. The wall of the combustion chamber opposite the air venturi is provided with an inwardly extending V-shaped divider or splitter, extending from bottom to top. The fuel nozzle which is exteriorly of barrel shape and of venturi form interiorly is located centrally of and with its outlet and terminating near the vertical plane of the throat of the air venturi. In the body of the fuel nozzle adjacent its venturi throat, there is an annular chamber having communication with the interior of the venturi by three Number 40 orifices, and also opening into the fuel inlet. This inlet is connected to a copper-lined steel-pipe fuel-line running to the float chamber, which is secured to the underside of the fan housing. This float is a high class stromberg, same as used in many of the best gas cars. The normal level of the liquid is held by the float at a point about 1 inch below the upper edge of the float chamber, which level is about 3½ inches below a line through the center of the fuel nozzle. The fuel therefore must be pumped up, aspirated or lifted this distance of 3½ inches before it can escape at the nozzle. The large volume of low pressure air from the fan rushes into the air venturi, part of which passing through the fuel nozzle, pulls a vacuum in the annular air chamber and fuel inlet, drawing up or aspirating the fuel, and as it trickles through the three small orifices is met by the air, speeded up by the venturi formed passage breaking up the fuel into a fine spray, expelling it with considerable force into the throat of the main air venturi, where it is met by the rest of the air which passed around the fuel nozzle and here mingling with the spray the fuel is blown into the combustion chamber and there coming in contact with the pilot light, which will be referred to more fully later, bursts into flame. Upon thus becoming ignited, the flame being projected with considerable force against the splitter, is divided, bent back upon itself, forming a vortex of flame on each side of the center line of the combustion chamber, thus forming what I have termed a fire box, the walls of which are walls of incandescent white hot flame. Into this is being projected the finally divided or sprayed fuel and air in just that proportion to effect as near complete diffusion as mechanically possible to produce.

With the ordinary oil burner wherein high pressure air or steam is used as the atomizing agency, a great volume of flame results, making necessary a fire box of sufficiently large proportions to permit of proper diffusion before the temperature of the gases have fallen below the point of ignition, diffusion taking place subsequent to the formation of CO. This is also true of the coal burner, and even to a greater degree.

Oil Burner Gives Perfection Diffusion.

With the oil burner, due to the fact that the quantity of air for combustion and the draft can be held constant, perfect diffusion subsequent to formation of CO is possible in connection with the large body of flame and the necessarily large fire box. With the burning of coal, this subsequent diffusion is much more difficult of attainment. In connection with the ordinary house heating unit, it is purely haphazard. How many of us know anything about the proper firing of a coal burning furnace? Even those of us that do know, ruthlessly violate every principle upon which proper combustion depends, every time we fill the furnace. That frequent firing to maintain a comparatively thin fuel bed and the constant manipulation of ash pit draft and stack damper, essential to proper and complete combustion is practically an impossibility in the coal burning house heater.

Incandescent fire box walls hasten diffusion and hence shorten the flame; and where practically complete diffusion is attained before combustion begins, such as in the ordinary Bunson gas burner, many, if not all, the difficulties attending complete combustion disappear. With the device under consideration, in projecting the finely divided fuel mixed with the propor proportion of air into this white hot flame-walled furnace, every atom of CO simultaneous with its formation is met by and combines with that other atom of oxygen to the immediate formation of CO_2. The time element, so difficult to control in the combustion of coal, is here absent. The CO atom and the oxygen are here confined by the swerling action a sufficient time to insure their combination. The CO cannot get away and wander about until loss of temperature below iginition point renders combustion impossible This combustion chamber is, therefore, a highly important, if not the most important element or factor of the burner. Due to the fact that complete combustion and the production and concentration of exceedingly high temperature takes place within itself, it is capable of insertion into any style or type of fire box or furnace, hot water, steam or hot air. That it is in no manner dependent on the shape, form or contour of the fire box wall with which it may be associated makes it possible to build and ship the burner as a complete self-contained unit.

Mr. Frenier was followed by B. G. Watson of Columbus, Ohio, who discussed "The General Proposition of Credits" in a very able manner. The principal parts of his address are reproduced herewith:

An Address on the General Proposition of Credits, Delivered to the Seventh Annual Convention of the National Warm Air Heating and Ventilating Association, April 21, 1920, in Hotel Cleveland, Cleveland, Ohio, by B. G. Watson, of Columbus, Ohio.

Every man has or should have a business and a hobby—a vocation and an avocation—a place in which he toils and another in which he has his recreation, a place where he earns his money and another in which he spends it. Almost twenty years ago while engaged on some professional work as counsel for one of the wholesale houses of Columbus I was invited to become, temporarily, the secretary of the Columbus Association of Credit Men. Since that time the Association has not shown any marked inclination to select a permanent secretary, and, during all these years, while I have been actively engaged in the practice of law as my vocation, I have found the study of credits and business conditions a very pleasant and interesting avocation, which has developed into a hobby.

Ninety-five Per Cent of Business Is on Credit.

I am asked to discuss the general proposition of Credits, and in doing so, I shall assume that credit is a necessary factor in the conduct of your business. It has been estimated that as high as 95 per cent of the business of the world is done on credit in one form or another. Conditions which have prevailed during the past few years have materially reduced the volume of credit business and have shown that it is possible to eliminate a much larger proportion than has already been done.

We Are on a Seller's Market.

During the past few years we have been on what is known as a seller's market. The quantity of merchandise has been limited. It has been possible for those having merchandise for sale to select their customers and sell to those from whom the possibility of credit loss was reduced to a minimum. At the same time the amount of profit which has been realized by those who were fortunate enough to obtain ample merchandise has placed such merchants in position where they should be able, not only to meet their obligations promptly at maturity, but should have made them discounters or cash customers; and, if they have merchandised as successfully as it has been possible for them to do, they should now be in position to meet all obligations on practically a cash basis.

Having for a number of years been in a rising market it has been easy for the merchant to realize a profit. The result has been that a great many who were formerly regarded as mediocre have now become successful merchants; at least they so regard themselves.

Putting Fluid Capital Into Fixtures and Buildings.

There has been a tendency on the part of merchants who have been successful and have made substantial profits, either to enlarge their business unduly, speculate, or invest in real estate or securities, and only keep the normal volume of money in their active business accounts. They have been inclined to tie up what should be fluid capital into improvements, fixtures, increased buildings, and enlarged trade so that many merchants are now in actual danger, for by reason of so tying up their capital they will not have sufficient ready assets to enable them to ride down with the decline.

This is, in my judgment, the particular time in which you should pay more careful attention to credits and credit conditions than you have ever done before. The merchant who is now a discounter, unless he has carefully preserved his increased earnings, will, on a declining market, become a term customer, and a term customer will become a delin-

quent. There is an ever-present temptation to spend surplus earnings; it may be to spend them foolishly; it may be to unduly increase the business; it may be to invest in securities or new buildings, or other forms of permanent investment, or, yet worse, to speculate on the market or wildcat in oil, thus placing the merchant's funds where they can not be realized upon quickly when money is needed. It makes little difference as to the manner in which the money is spent if it in fact is gone when the merchant needs it. I should, therefore, advise all houses to require their customers to adhere more strictly to their terms than they have ever done before, and I make this suggestion no more for the protection of you as manufacturers and jobbers than for the protection of the merchant.

Do Not Let Past-due Accounts Accumulate.

At no time should I advise that past-due accounts be allowed to stand and accumulate, but particularly at this time should I urge the importance of most active attention to your receivables. When an account is due and your customer does not respond to your usual methods of collection, and remains silent despite your statement, your follow-up letter, and your draft, and certainly within thirty days or less, the account should have attention outside of your office routine. You may feel that it is safe and that you do not want to pay collection charges. If so, your secretary has a most efficient and inexpensive system of dealing with delinquent accounts, which is always available. If the pressure which his office brings to bear does not produce results, then you know positively that more drastic remedies are necessary. When you place an item of collection with your secretary, he shoul have authority to do with it whatever in his judgment the circumstances require, and should have the authority to pass it on for proper attention without the delay incident to obtaining especial instructions in each individual case. This practice will be less expensive to you at the end of the year than the lax one of allowing your customers' accounts to accumulate, and this will be particularly true in the year in which a sharp decline in prices comes. Since you do not know *when* that time will come, but you do know that it *will* come, eternal vigilance will provide the only element of safety.

Connection Between Credit and Sales Departments.

I am speaking of these two departments as separate institutions. In this I find myself falling into a common error, for the credit department and the sales department are so closely related that it should be impossible to tell where the domain of the one begins and that of the other ends. The successful credit man may be, and in many houses is, the star salesman. By diplomatic letter writing, and careful consideration of the customer's needs the credit man may increase or decrease the volume of business which the house may successfully do, or he may greatly interfere with the best-laid selling plans where the departments are not coordinated.

Urges Membership in Association of Credit Men.

I take it that the members of this organization or the credit departments representing them, are members of the National Association of Credit Men. Should you not be, my earnest recommendation would be that you immediately become so identified in your local cities; and that you may know my reason for this recommendation may I suggest to you some of the important activities of that organization? It is responsible for the passage of the sales in bulk law in practically every state in the Union. It had more to do with the adoption of the Federal Reserve system than any other business organization. It is responsible for the bad check law in many states; for the changing of the filing of chattel mortgages from the office of the township clerk to the office of the recorder of the county, and has done more constructive work in building up safe business legislation and conditions than any other organization in existence.

Get Full Credit Particulars.

Does your credit department inquire whether or not your customer is carrying insurance? Did he ever have a fire? Has he many or few competitors? Is his store well-kept, well-stocked and well-managed, or is it run down and his stock poorly arranged? Are his habits good or bad? For what purpose does he want an unusual extension of his line? Does he have a satisfactory home life or an extravagant, irritating, nagging wife? Does he gamble, dissipate, speculate, horse-race, joy-ride, or is he attentive to his business and industrious in its management? All of these things your credit department should know, and can know by intel'igently using the means which are now at your disposal.

When production equals or exceeds consumption, when we change from a seller's to a buyer's market, when prices begin to decline, and the merchant must take his loss on goods which he has in stock, then the question of your credits will be of the utmost importance and the information which I have just detailed will be vitally necessary. While we do not know when prices will decline we do know that the surplus of a commodity over the demand is what fixes the price. Whenever production exceeds consumption the price is bound to decline. The natural law of supply and demand will immediately become effective and the extent of the surplus will determine the extent of the decline. Lower prices will come either from increased production or from the closing down of industry and the formation of the breadline. It is largely up to business concerns such as you represent to determine which way these lower prices will come. When the time comes, in the natural course of events, for prices to break it will be the men occupying positions similar to yours who will determine the manner in which the return to natural levels will be accomplished. If you are careful in your credits, if you are persistent in your collections, if you require your customer to live up to your terms, if you require him to keep his surplus in his business—some of which will have to be preserved to absorb the loss from the reduction of prices—then it may be possible for the decline of prices to come normally through increased production and careful merchandising. If, on the other hand, you allow your customer to depart from his terms, to dissipate the reserve which he should have by reason of the prosperous era, then you will find that bankruptcies will be frequent, that failures will be as common as they were in 1903 and 1907 and we will have the inevitable breadline.

Harmful Effect of Excess Profit Tax.

Some attribute the situation to the excess profit tax. It undoubtedly is now sapping the life out of initiative and enterprise, and is placing unwarranted and unnecessary burdens upon business in an attempt to pay an unreasonable proportion of the cost of the war in this generation. Whatever the cause of it may be we are in the midst of a situation which, while it is not a crisis, constitutes a very pronounced disturbance and will inevitably lead to a crisis unless proper measures of safety are taken by sound and sane business executives.

The number of drives which were put on during the war for the multitude of purposes, the number of people who were enlisted in their support, the amount of conversation which has been held concerning the war, and the peace treaty and the league of nations, and the general slowing down of business which all these things have entailed, with the number of strikes which have occurred, have caused a tremendous economic loss. In England three million days of time were lost during the year 1919 by reason of strikes, and this capitalized at the average wage of $5.00 a days makes $15,000,000 which was lost to the workmen by reason of strikes and lockouts in that country alone.

The Sunnier Side of the Picture.

But, there is a sunnier side. The world has not gone to pot, and is not going. We have abiding faith in our institutions, and we know that while we are going through a period of unrest, and of turmoil and of strife, that sometime—and let us hope at a very early date—the sun will shine again, and we will have the happy, prosperous and contented people that we had before the war. The world's greatest achievements have always followed periods of its greatest strife, and that will happen again.

A prominent man, closely connected with the War Industrial Board as an expert, in a recent address makes the positive statement that, aside from the loss of life during the war, which, of course, can not be replaced, restored or remedied, the business secrets, the engineering, expert and technical knowledge of all the world which has been placed in a common melting pot, has developed sufficient new ideas so that if capitalized they will within the next twenty-five years create in the United States twice the amount of dollars and cents of the whole expense of the war. He illustrated his statement by concrete examples of the development in electricity, air craft, chemical and scientific devices which may be applied to labor-saving and profit-producing in industry.

The Chief Problem Is Increased Production.

Just now our problem is one of production. We must look the situation squarely in the face, and, with undaunted confidence, cool heads, willing hands and loyal hearts, we must set ourselves to the problem of restoring business conditions. In short, we must go to work, and, if possible to improve upon the expression, "Let's Go" which has become so popular recently, let us add four words, "Let's go to work and produce."

The "Commercial Side of Our Industry" formed the topic of an interesting address by Edward Norris of Utica, New York, the full text of which is as follows.

Address on "The Commercial Side of Our Industry," by Edward Norris of Utica, New York, Delivered to the Seventh Annual Convention of the National Warm-Air Heating and Ventilating Association, April 21, 1920, in Hotel Cleveland, Cleveland, Ohio.

Our industry naturally divides itself into three major departments—Manufacturing, Selling and Financing. Clear thinking is generally easiest for the executive if the factory is

regarded as a separate business,—as if the product were purchased complete from a distinct organization. I take it that the commercial side of our industry embraces "Selling" and "Financing" although intimately concerned with the manufacturing department to the extent that fair costs be secured and sufficient production be maintained,—just as it would be if the factory were an entirely separate business.

The Sales Department is the mouthpiece of the organization. However well the factory may do its work, however excellent the goods and the low costs, nothing can be accomplished without the work of the Sales Department. Watt's steam engine would never have come into general use but for sales effort of some sort. Neither Edison's phonograph nor the moving pictures with their vast possibilities for educating the public would be used as they are today but for selling organizations. Columbus had to first sell his idea before he could start the voyage that discovered America. The conscientious salesman is as truly a producer as is the molder. He really does more to give the public the benefits of his product,—which is after all the prime reason for industry's existence.

The Old-Time Sales Manager.

We can all bring to our minds the picture of the old time Sales Manager scanning a list of his competitor's customers and sending his salesmen scurrying around to offer sufficient inducements to take them away. Fortunately this is a picture that is rapidly fading. Live concerns have come to realize that the volume of heating apparatus sold in this country is not a fixed quantity,—far from it. Our Sales Departments must have the vision and the initiative to develop this volume to the utmost, thus rendering a service to the whole industry, and at the same time giving to more people the untold benefit of healthful heating apparatus. This view of the Sales Manager's place takes away the narrow thought of merely working for his salary or his share of profits, and makes him a public benefactor whose reward is incidental but in full proportion to his service. This thought constantly borne in mind will automatically do away with most of the narrow methods of destructive competition which we have known in the past.

Functions of the Sales Department.

A good Sales Department should do something more than make sales. Being in close touch with the public it is best able to criticize the factory's product and suggest improvements. It is not the office of the Sales Department to explain away the defects of poor goods, but to have these defects corrected and the product kept abreast or ahead of the times. Diplomatic words never satisfied a man with a poor heating plant and never will. The wise Sales Manager will try to uncover every unsatisfactory installation of his product, make it right, and take measures to see that it does not happen again. The dissatisfied user is a greater handicap to success than dull times plus shortage of capital.

The nature of the heating business makes us dependent on the installer to give satisfaction to the ultimate consumer. Unconscientious or careless contractors should not be tolerated. It is easy to find out whether the installer is doing his work badly or well, and it is the duty of the progressive Sales Manager to ruthlessly eliminate the bad installer by refusing to sell him. He should do it on one or all of three theories:—It is only fair to the purchasing public; it is for the good of the industry; it pays. Take your choice of the motive, but eliminate the bad installer. If done it will be the biggest thing this industry can do and will mean not lessened business but enormously increased business and greatly increased pleasure in doing business.

I recently called on a friend of mine who was living in a rented house. It was a very cold evening and the house was so cold that it was a choice between overcoats and freezing. He complained bitterly of his heating apparatus and of the amount of coal he was burning, which naturally led to an investigation. The furnace was fully big enough for the house and was being run so hard that the cellar was uncomfortably warm. In a few minutes any man in this room could have discovered his difficulty and told him how to correct it,—simply a question of poor air circulation. After a few inexpensive changes were made the heater gave perfect results with a reasonable quantity of fuel. The furnace was a perfectly good one, but was badly installed, and its failure to give results was reflecting on the whole warm air industry. I have no doubt this happens with the product of every manufacturer represented in this room, and ninety-nine per cent of it could be done away with by refusing to sell the poor installer.

Another important function of the Sales Manager is to educate young men who will make high grade salesmen and be ready to advance to the more important positions as opportunity offers. We need new blood in our sales departments. We need the kind of men who realize the possibilities of this industry and are ambitious to attain them. We need to bring along young men who will produce the ideas for the future development of the industry.

The Matter of Setting Prices.

The matter of setting prices is one that naturally comes to the Sales Manager acting with the Accounting Department, and there are here many important decisions to be made. Prices should be set on the basis of a fair return on the capital invested. Full advantage should not be taken of a "seller's market." To do so is to help stop business and to invite new competition. Neither should ruinously low prices be made on account of unintelligent competition. If unintelligent competition exists let it kill itself through its failure to provide funds for developing its facilities. That will happen as surely as water flows down hill,—let nature take its course. It is far surer than the obsolete practice of price agreements which always have and always must utterly fail.

The One Price Policy.

Most important is the establishment of the one price policy. The old idea of meeting a competitive price here and giving a special price to a sharp buyer there should be abolished. If a price is changed for one customer it should be changed for all. To ask a higher price from the loyal customer who does not shop around than you would accept from a shrewd and sometimes unscrupulous buyer is unfair business. Furthermore it takes the attention of the Sales Department from the big vital issue of developing the business and reduces them to the level of small minded traders who are continually trying to decide what the traffic will bear. Due allowance may be made for the quantity purchaser, but let it be the same for everybody and if it is revised for one, let it be revised for all. Nine buyers out of ten respect this policy. It is not necessary to make a buyer feel that he is getting a little lower price than anybody else. If he is wise he won't believe it anyway. The average customer is honest and fair-minded and only wants a square deal. If he knows he is getting as good a proposition as anyone else he is satisfied, and the old proposition of haggling over prices and terms is eradicated.

It has often been stated during the last few months that in these times when the demand exceeds the supply the Sales Department is almost superfluous,—that it could almost go on a vacation without injuring the business. With this idea I can not agree. While it may be true that the aggressive methods associated with an up-to-date Sales Department are not needed in these times, the Sales Manager and his force have functions to perform which have a vital bearing on the future of our industry. A factory may be oversold and the buyer may be the man to do the traveling, but it is a great mistake for the Sales Manager to take advantage of this situation to gratify a very human temptation to be independent or arrogant. On the contrary a big opportunity is being offered him to cement the friendship between the customer and the house and to advance the important thought that the manufacturer and the dealer have almost identical interests and should regard themselves as partners in advancing the industry they are engaged in. The Sales Manager who does not take advantage of this opportunity is committing a crime he will expiate in full in the "buyer's market" which is surely coming back some day. On the other hand if our combined Sales Departments work intelligently and well through this period of excess demand the entire industry will be wonderfully strengthened for the future. The Sales Manager should always remember that awakening an old customer to his opportunity of developing business is generally of greater importance than securing a new customer.

The Financial Department also falls within my subject. This department should to a large extent govern the making of terms and the policy regarding collections. Such terms should be sent as will permit the dealer to carry a suitable stock without undue hardship. This does not mean however that the manufacturer should carry the stock, which is very bad practice, encouraging overbuying, increasing the manufacturer's risk and making it necessary for him to invest an excessive amount of capital. The dealer should so arrange his financial matters that he can carry sufficient stock to give good service and can pay for it on reasonable terms.

Definite Basis for Making Terms.

Terms should be made on a definite basis and it should be understood when the sale is made that they are to be observed. The manufacturer who is slack in his collections is really doing an injustice to his customers, as such practice encourages the dealer to be careless in his collections and helps to make him a poor business man. The use of the Trade Acceptance which has now become so general is a great benefit both to the manufacturer and to the dealer. It helps the manufacturer in financing his business and reduces terms to a more clear cut understanding. It encourages the dealer to arrange his collections so that he can meet his obligations promptly, thus reducing his risk and keeping his business clean.

A subject of great importance is in the minds of most manufacturers just at present; namely, the extension of facilities so as to turn out more goods. This is a subject in which all departments of the business are jointly and vitally interested. Before deciding to extend, the Sales Department must be sure that the demand is of a permanent nature; the Financial Department must arrange the necessary funds without reducing the working capital; and the Manufactur-

ing Department must be sure it can organize the additional space so as to operate it economically.

The Tendency to Over-order.

It should be borne in mind that in such times as these there is a certain amount of fictitious demand. There has been a strong tendency for dealers to over-order so as to insure themselves of prompt deliveries and to protect against advancing prices. We must not be deceived by this condition into thinking that there is a larger absorbing power for our product than is actually the case. Furthermore the excessively high costs of building and equipment should be given full weight, and before new investments are made it should be definitely ascertained that the present facilities are producing to their utmost. Every inch of floor space should be used to the limit before extensions are considered. As has been pointed out by banking interests, in these times there is great danger of putting up factories which cannot permanently pay fair returns on the large investment needed.

Another joint interest of prime importance is in the matter of shop efficiency. I think we all recognize that high wages are desirable, but they must be accompanied by a high rate of production. It may be easy now to pass along to the public excessive costs, but it will not always be so. One of the most difficult things to correct in a factory is restricted production and it is our duty to ourselves and to the public to see that it does not become established in this industry.

At the conclusion of Mr. Norris' address another applicant for membership in the National Warm Air Heating and Ventilating Association was voted on, thus bringing the total of new members at the Convention up to seven.

A. C. Willard, Professor of Heating and Ventilation, University of Illinois, then resumed the report of the progress of the Research staff, having for his subject "The Pipeless Furnace Testing Plant and Results of Efficiency and Capacity Tests on a Pipeless Furnace." He gave the dimensions as: 28-inch fire

A. C. Willard, Professor of Heating and Ventilating, University of Illinois.

pot; 22-inch grade; 64-inch outside casing; 29⅜-inch round outlet register (free area = 2.83 square feet); 39¼ by 39¼ square inlet register (free area = 3.39 square feet); inside casing (large 55 inches, small 52¾ inches); and throat diameter of outlet 28 inches.

Warm-Air Furnace Research Pipeless Furnace Tests.

(University of Illinois.)

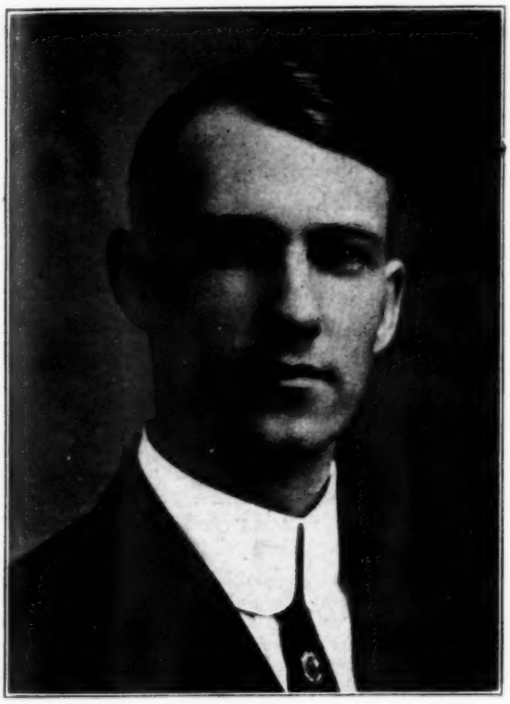
Note—See chart.

Items.	Test No. 2.	Test No. 3.
1. Date of test	4-15-20	4-17-20
1. a. Barometer inches of mercury	(28.90	(29.14)
2. Duration in hours	12.0	12.0
3. Average temperature degree Fahrenheit at regular face by thermo-couples (actual) degrees	192.0	184.0
4. Average temperature inlet air degrees Fahrenheit	79.8	78.9
5. Average equivalent temperature degrees Fahrenheit at register face (above 65 degrees inlet)	177.2	170.1
6. Average temperature rise inlet to outlet, degrees Fahrenheit	112.2	105.1

V. S. Day, Research Assistant, Engineering Experiment Station, University of Illinois.

7. Total weight coal fired, pounds	250.0	250.0
8. Total weight dry refuse out, pounds	124.5	125.2
9. Total equivalent coal in refuse, pounds	105.1	109.2
10. Total weight coal burned, pounds	144.9	140.8
11. Rate of combustion, pounds per per square foot of grate	4.57	4.43
12. Average chimney draft	0.046	0.050
12. a. Average flue gas temperature, degrees Fahrenheit	543	524
13. British thermal units per pound coal as received	12,791	12,791
14. British thermal units per pound dry refuse end of test	10,790	11,120
15. Heat developed by total coal burned per hour, British thermal units	154,200	150,000
16. Weight in pounds of air leaving outlet per hour	3,670	3,500
17. Cubic foot of air leaving hot air register per hour at temperature item 3	62,500	58,500
	Density 0.0587	Density 0.0598
18. Velocity feet per minute through free area outlet (2.83 sqquare feet)	368	344
19. Velocity feet per minute through throat outlet 28 inches (4.28 square feet)	243	228
20. Velocity feet per minute through free area inlet (3.39 square feet)	254	241
	Density 0.0709	Density 0.0715
21. Heat put into air per hour between inlet and outlet, British thermal units	98,800	88,300
22. British thermal units available in air above 70 degrees Fahrenheit for heating house per hour per square inch of throat area	174.0	155.0

23. Overall efficiency of furnace in per cent	64.0	58.8
24. Heat lost in flue gas (approximate) in per cent	14.6	14.8
25. Average CO_2 in flue gas in per cent	16	15
26. Heat lost by radiation and unaccounted for, per cent	21.4	26.4
27. British thermal units put into air between inlet register and bottom of shield	14,280	13,120
27. a. Average temperature of air at bottom of shield, degrees Fahrenheit	96.0	94.5



A. P. Kratz, Research Associate, Engineering Experiment Station, University of Illinois.

28. Per cent of total heat put into air which is transmitted by inner casing to entering air	14.5	14.0
29. Maximum temperature on underside of 9-inch concrete floor below furnace	167.0	161.0

Professor Willard was followed by Henry P. Gale of Oneida, New York, who spoke upon the topic of "Humidity." He made a strong plea for adequate humidifying appliances and clearly indicated the relation of humidity to health. The text of his address is as follows:

Address on "Humidity," by Henry P. Gale of Oneida, New York, Delivered to the Seventh Annual Convention of the National Warm Air Heating and Ventilating Association, April 21, 1920, in Hotel Cleveland, Cleveland, Ohio.

There must be quite a responsibility assumed by any Committee who invite a speaker unknown to the general public to address them, in that the subject may be of interest to the assembly, but the method of treatment may be offensive; as a great opportunity is given to flay the audience as preachers are wont to do.

All men who study any given subject of Hygiene are liable to be fanatical as the subject grows on them and the public do not go along with them in the use of the ideas produced. Several generations of men have preached the use of the Metric system of measures, and we as a nation still use the cumbersome foot rule, and I expect that many generations may come and go before proper Humidity will be used in our homes.

Rules of Health Are Often Broken.

The War committees on coal consumption in factories found conditions that were appalling as to the mis-use of coal. I am now saying to you that a mighty small number of plants continue the rules that were then given for economy by men competent to know, and at no cost to them. The continuation placed a small load on the man higher up to see that it was done. Then how can I feel that this small contribution to health will be taken care of? Some rules of health are broken every day, and we take a pill weekly to offset that. My only hope is that you will add to your devices, that part necessary, and that they will be automatic or nearly so, as we find that we will spend the time once to make things right, but dislike to do anything regularly.

We will place water in the cigar humidifier when they taste pretty bad, and here is one mark of the proper humidity of a house. Cigars will always smoke well, even if open in the room, if the humidity is right to live in.

There is very little for me to say new to you, if you read the magazines of your trade on heating and ventilation, but I hope to say it in words that will reach your present understanding. I have to sell you on the idea that it is proper for you to add your force to aid in the public welfare. You would today pass a resolution that proper humidity would add to home comfort, but will you do the one little thing that will help your own home and the homes of the clients you serve in making your living?

Defines Relative Humidity.

I shall use the subject of humidity in the home as a layman, looking as I have, for rest to tired nerves, freedom from some of the ills of the home, such as creaking chairs, panels that show the bare wood instead of the varnish that we paid the builder to show; to give flowers that we love a chance to be with us the long winter days, in order that they may add to our joy in looking at their cheery faces. What chance do we give one delicate mucous membrane, if we maintain a house so dry that a fern will droop and die? Remember that the sensation of heat and cold is transferred to you by the moisture in the air. You have about the same sensation of comfort in a room at 65 degrees Fahrenheit and 50 Relative Humidity as you have in the summer in the open air at 60 degrees Fahrenheit and the usual 75 Relative Humidity, or in a room at 72 degrees Fahrenheit and 20 Relative Humidity. Sitting in a room at 75 degrees Fahrenheit and the usual Relative Humidity, you will feel any draft of outside air with its high humidity, when if that room had been 65 degrees Fahrenheit and 50 Relative Humidity, there would be no chill. At the risk of being in the primary class, let us start right on what Relative Humidity is.

Air at zero can hold 0.48 grains of water.
Air at 60 can hold 5.47 grains of water.
Air at 74 can hold 9.06 grains of water.
Air at 160 can hold 42.13 grains of water.

At 60 degrees Fahrenheit it may hold 5.47 grains, if it does hold 2.73 grains, we would say it was 50 per cent of what it could hold, or that it was 50 Relative Humidity. Now this table shows that the air can hold the most water at the highest temperature (that is, in the dome of your furnace) and it follows that here, and here only, is the proper place to introduce water. The air in the dome varies directly as the coal burned to cover the British Thermal Unit heat necessary to heat the house. The speed of the air through the dome varies in the same way, by the demand for heat units in the building. For these reasons, it follows that if a correct form of water dispenser is used and set for any temperature, it will give the proper amount of water for any other temperature, being set loose by the heat and the velocity of air passing by it.

This winter I have watched two installations. The first having 13,000 cubic feet, which has taken an average 17 quarts per day; the second having 30,000 cubic feet, which has taken from 18 quarts in December to 42 quarts in January, besides that given off by cooking. Velocity of the air passing through the device is the great factor, and much more than the temperature of the water.

Benefits of Fresh Air.

The one and only benefit that comes by having open windows at night is the high average humidity, which soothes the tired nerves, envelops the body in air fit to live in, and deposits the dust on the floors instead of leaving it to float to be breathed. Remember, however, that the more fresh air at night, the more water during the day to make the house clean and wholesome. The figures of temperature given you as the comfortable zone are worth your careful attention, as an educator of this foolish American people, your attention, in that you have quite a responsibility to give the best there is in your art at the time of sale. In 1820 books called a good heat for a house 50 to 55 degrees Fahrenheit; in 1850 it was said to be quite comfortable at 62 degrees Fahrenheit; in 1890 at least 72 degrees Fahrenheit was needed, and now 78 degrees Fahrenheit is quite common. These increases in temperature mark clearly the passing from Fireplaces to Stoves to Furnaces to Steam.

On the third day of this spring, March 24th, I sat at my drawing board at work for four hours by an open window, in perfect comfort, with a temperature of 69 degrees Fahrenheit. You could not sit in your house any day of winter at 60 degrees Fahrenheit in comfort. That outside air had a Relative Humidity of 75, but your house would have had 20 to 25. Now, gentlemen, we are at your responsibility. If this statement is correct and you can verify it

from your own memory of events, you have not done your duty to yourselves and to your clients who trust you; if you do not manufacture your heaters so that they will add to the dry air the proper amount of water to correct the humidity, so long as you (directly or indirectly) advertise that it will do so.

Inadequate Water Pans.

Out of 36 heaters examined, 26 showed some form of an humidifier, and only 3 had the pot so placed that any appreciable amount of water could be added to the air passing. I feel that those of you who show such a design, will after this talk and the questions that will be answered today, make such changes as are warranted, because you are not viciously in error—only carelessly in error.

In cold weather, the air must be displaced from three to four times per hour in order to get the proper British Thermal Units displaced, and from the amount of outside cold air taken in, it will have about 20 Relative Humidity. It is this dry kiln effect that destroys furniture, makes the chairs creak and all mucous membrane swollen in the attempt to moisten the air for the lungs.

Dry Air Is an Irritant.

One of the largest builders of central New York has said to me many times that if I could convert the heater makers so that they would make a heater that would keep the air at a proper humidity (so that the woodwork would not shrink), nine-tenths of their kicks would cease when they build a house of value. Dry air is always dusty air. Dusty air is always an irritant. I have repeatedly changed a room of 25 Relative Humidity and a dust count of 225,000 to 30,000 count by simply changing the humidity to 50 degrees. Take any bedchamber at 20 Relative Humidity and look at the dust betrayed by a sunbeam when you dress; old skin, wood fibre, lint from cotton, linen, feathers. All of these we breathe, but they are quickly deposited if the room has a humidity of 50. The floors and furniture are a better place for these than the lungs. You will "wolf" about your city water, but pass this question of dust that is your particular responsibility.

Healthy, Humid Heat.

Can you imagine a case of nerves on a June morning? The air from a register at 50 Relative Humidity feels very much like balmy June, but air at 20 Relative Humidity burns the skin, as it sucks the water from you as from a sponge. Blood-pressure is always higher with a low humidity, and low with a high humidity. I wish to make one statement now—I want it to sink in; penetrate—*that no house has healthy air if frost does not form on the windows on a cold or windy day.* This is proper mark of *humidity.* It also is the *sterling* mark of your trade, well done. *Healthy humid heat.* Advertise it; preach it; but above all, make it.

Air Must Be Fit to Live In.

As a matter of fact there have been no tests made which say that any particular humidity is just the one we should have, but those skilled in the art of hygiene say it must be above 45 to clean out the dust, and at from 45 to 55 there are no valid household objections. From a money cost of coal, if you have the same sensation of comfort at 64 degrees Fahrenheit as at 75 degrees Fahrenheit and a dry air, why spend the money for the extra heat? The expression of hygienists, that "air must be fit to breathe, and also fit to live in," means that it must be good air; that it must have moisture enough in it so that we do not perform the act of the human sponge—hold water to have it sucked from us. Forget that "bunk" about the heat of certain furnaces burning the air. The dust from a room not humidified might be purified by contact with hot iron, and have an odor. In my house, it will not, for the dust will not float.

I have found a way to humidify the air through a hot air furnace; others have found a way for hot water and steam. Perhaps these can be bettered. At least it seems to me that some form can be found that is part of your devices that will be semi-automatic. Is there any business reason that the one, best way should not be found and used in common? You have a committee working in some college that is to find the best use of the mechanical laws that govern the heating art, for the common good. Can they help you?

Desirability of Proper Humidity.

It seems to me that I have found quite a bit of fault with you and said few things about the practical business end of the subject, but I hope that you will ask the questions that will clear all those cobwebs from your mind; that some good will come to you and your clients. To my mind (and I hope to yours just now) there is no question as to the desirability of proper humidity, but in your minds you will wish to have to yourself the advantage for the device. Can you not think in a broader way? When I think of the people you sell through, I pity you, for I know their limitations.

J. M. McHenry of St. Louis, Missouri, Chairman of the Advisory Committee on Warm Air Furnace Research, made a clear but terse report of the work of his committee.

W. D. Cover as chairman of the Nominating Committee reported the same officers with the exception of John D. Green, of the Executive Committee, in whose place D. Rait Richardson was nominated. The following members, therefore, constitute the administration of the Association for the ensuing term:

President: W. G. Wise, Akron, Ohio;

Vice-President: John A. Howard, Dowagiac, Michigan;

Treasurer: I. L. Jones, Utica, New York;

Secretary: Allen W. Williams, Columbus, Ohio.

Executive Committee: D. Rait Richardson, New York; E. P. Miller, Marshalltown, Iowa; G. D. Wilkinson, Chicago, Illinois; R. C. Cook, New York; and the Officers of the Association.

Because of lack of time in which to present it in full, W. D. Cover announced that he would not read his paper on "The Industrial Side of Our Industry," but that it would be printed in the report of the proceedings of the Convention.

Address on "The Industrial Side of Our Industry," by W. D. Cover of Crestline, Ohio, Prepared for the Seventh Annual Convention of the National Warm Air Heating and Ventilating Association, April 21, 1920, in Hotel Cleveland, Cleveland, Ohio.

It seems to me that this subject is of much importance, and I am unable to do it justice. At this time it is much more important than the Commercial side. The same old conditions exist in our Industry—that, as a rule, we are better manufacturers than merchants. But it doesn't mean that we can not improve the Industrial side of the business or learn to our advantage from the discussion of manufacturing problems at our meetings.

As we get better acquainted, as we come together, it instills that confidence in one another that we would never get if it was not for these meetings that we have in the different organizations connected with the Furnace Industry. By being better acquainted we discuss the different problems that confront us, and at this time the Industrial side of the business is of very great importance. Everyone of you realize this, and it is unnecessary for me to dwell upon it.

The Question of Open Shop.

The question of an open or straight Union shop enters into the Industrial side with a great deal of consideration. I do not believe that costs vary much in net results. Some of you are operating open shops—that is, I think you are. I am not positive that I could name any individual manufacturer who is operating an open shop, but no doubt some of you are. In our own case, we operate a Union shop.

In some respects the open shop has advantages over the closed shop. In other respects we have some advantages over the open shop. I believe that in the final analysis there isn't much difference, and it has been a question in my mind whether we are better off in operating one against the other.

We pay the same for iron; we pay the same for coke; we pay practically the same for molding; we pay practically the same for common labor. Our breakage is about the same. Labor in our cleaning rooms is about alike. Now our castings cost about the same when they go into the mounting room.

Let me analyze it in this way. It is a matter of buying and selling—purely a business proposition. The men who work for us are bargaining with us. They sell us their labor, they sell us their time—in the same way that we go out to sell our merchandise to our customer. I wonder if we treat them in the same way that we want our customer to treat us when we sell him our product?

When we go to sell a customer one furnace, or twenty-five, or a hundred, we try to get his best attention. We invite him out to have dinner or lunch with us, and we do everything to keep his attention and convince him that we have the best piece of goods, and sell him at a profit. Now why shouldn't we do the very same thing when we are dealing with our employes? If we handle them as tactfully

as we do the Commercial side of our business, I believe our results would be much better.

Keep Producing Side Separate from Commercial.

The Manufacturing or the Industrial side of the business should be kept separate from the Commercial or selling end. In this way the mistakes of the selling end would not be blamed upon the production side. A good many times this is the case. Of course we realize that it is absolutely necessary that the goods be manufactured in the best possible manner, that they comply in every respect to the recommendation that is made by the salesmen. It is quite necessary that these two sides of the business work together to accomplish the best results.

In order that each side of this be kept in such a manner that the one side is not blamed for mistakes of the other, it is necessary to have proper records. I can not say that we have the best system in our factory, but we try to have a system that enables us to keep separate the Manufacturing from the Commercial side of the business. I believe if you will all follow this, it will reveal a great many things to you that will be of value.

The Value of Proper Rigging.

In order that we keep our men in the best possible frame of mind, it is necessary that we equip our shops with the best rigging that is obtainable. A great many of us lose sight of the fact that this is a very important item for consideration.

I once heard of one of the big steel mills that was operated by Mr. Carnegie. He had just installed a lot of new machinery at a great cost. Before it was hardly in use, he discovered that what he had put in was a mistake, that there was other rigging and machinery that outclassed it very much. He immediately investigated the matter, and threw out all the rigging that had been installed, and replaced it with the latest and best that was obtainable. He thought it was good business and proved that it saved a great deal of money.

We have heard much talk about the sand blast—the cost of cleaning castings being much cheaper by the sand blast than by mills. Our experience is that if there is any difference in cost it is in favor of the mills.

A great deal might be said about the capacity of the different shops, and, if less than 100 per cent efficiency is obtained, why it increases the cost. I don't really believe it is necessary to go into this matter, but if we have a foundry with 100 floors, and we are only operating 75 of them, 25 of the floors are idle. We know that it practically costs as much money in overhead to operate the 75 floors as it would the 100. Whenever we are not operating up to our capacity it certainly increases the cost proportionately.

Welfare Work and Confidence.

One of the important things is to instill confidence and to keep our men satisfied. There are many plans that are recommended and are being adopted, and we have talked this matter over in our little organization quite a great deal. I know that a great many manufacturers feel as though the Welfare work that is done does not accomplish the desired results, but I believe the time is coming when we will have to give this much more careful consideration than is now being done. We have got to meet our men on a more equal basis.

I will give you something to think about, and that is, "Does the cost decrease much if a reasonable number of furnaces are being produced?" Our own experience has been that it does not to any great extent. I am leaving this open for discussion.

Another thing that comes to my mind is, "Does scrap or low grade iron give you a lower cost than good material or high grade iron?" We have demonstrated to our own satisfaction that scrap or low grade materials cost you just as much—and I think more—than good materials or high grade.

Limiting Variety and Sizes.

During the War we were asked to limit the variety and sizes of our furnaces. We have found that this was one of the best things that was suggested, or that we complied with, during the War. I think we were making ten different types of furnaces, and we had abandoned two or three at that time. We practically have placed our entire effort on one type and four sizes of furnaces. I mean by that that we are making what we all designate as a Standard Type Furnace. We make this with a cut front, we make it with a full front, and we make it in the Pipeless, but the castings are all interchangeable with the exception of the bases and the front.

The base on the cut front furnace is not as large as it is on the full front or the Pipeless. It is only necessary for us to carry ash pits and fire pots, and feed sections, and radiators of one kind. We must carry two different patterns and bases. Then, of course, the fronts are different, but it eliminates a lot of castings, and we find that it is of great advantage in the molding room. I dare say that 75 per cent of our furnace molders are working on the same job every day in the year. We find that the men are much better satisfied, we get better castings, and more of them.

I am wondering whether I ought to say anything about the Ideal Foundry, as to its size, height, melting capacity, and some other items? I think myself that the Ideal Foundry is one that will give you about 100 floors and a melting capacity of any place from 25 to 50 tons a day. If I were wanting to use 200 floors, I believe I would much prefer having them in multiples than having one shop with 200 floors. I leave that for your consideration.

Use of Molding Machines.

Another thing I just want to leave with you is the use of molding machines. Is it practical in all furnace shops? I took this matter up with a prominent company making molding machines a short time ago, and I told them that whenever they were ready to guarantee that molding machines would do our work, better our conditions, and make us some money, we were ready to take it up with them, but until that time we would rather not go into the matter. They were very frank to say that some pieces they were making on machines with the best results, other parts they were not having any satisfaction with whatever, but that they would take the matter up with us at a later time.

The last item that I want to speak about is sand cutting and shaking out for the men. No doubt our experiences are all about the same. We have been attempting since the first of the year to shake out and cut the sand, and we have been having a lot of trouble.

In order to make this a success, it is necessary that the men take on some responsibility and stay with the men who are going to do this work for some length of time and teach them just how to shake out, wet down the sand, and then cut it.

I myself think it is a mistake, but it has been agreed upon by the Defense Association and I think we should try in every possible way to make it a success. I am quite sure that if we could make the men see it in the right light that it would not be long until it would be working successfully. What I mean by that is that if the molders really want the mold shaken out and the sand cut for them, they should give it their best effort to see that it is done properly, because if it is not done and done right, they have trouble with their castings the next day and lose them. It is one of the things that is very necessary to the success of their day's work, in having the sand tempered right, so that they can put up the molds and get good castings after they are poured.

President Wise called on D. Rait Richardson for a talk, saying: "Before adjourning I am going to call on one man who has been a member of this Association I believe since its inception and who has not been here for several years. I think you would all like to hear a few words from Mr. Rait Richardson."

Address by D. Rait Richardson of New York to Seventh Annual Convention of National Warm-Air Heating and Ventilating Association, April 21, 1920, in Hotel Cleveland, Cleveland, Ohio.

I regret that I have not been as active in two or three past years as I should have if circumstances were somewhat different. There is one little matter that I want to reflect on a little which I do not think has been mentioned. It is my thought that your committees your officers may appoint in the ensuing year, and possibly longer than that, will be most important, and, of course, all standing committees are appointed by your president, and I want to urge that every man appointed on those committees give a little time and thought to his work. No doubt they have in the past, but in the future it is going to be even more important. I think the Freight Committee, which will probably be reappointed, not reinstated, but made more active again, is most important in the ensuing year. I think another committee which should have careful attention by the executive officers is the one on Publicity. There is much that can be accomplished by means of an active Publicity Committee. Rather blackguardy articles appear from time to time which should be answered, questions come up that the public should know something of and the Publicity Committee can be of great benefit. The Freight Committee may have to face a great deal of hard work before next September and whomever your president may appoint I urge them to give a great deal of conscientious thought because it is most important.

Praises War Service Committee.

You have, however, a committee known as the "War Service and Reconstruction Committee," composed of Messrs. John Howard, Edward Norris, Alfred Moran, E. B. Langenberg, John R. McKnight, A. E. Stockbridge, W. C. Williamson, G. D. Wilkinson and F. G. Sedgwick. I do not know whether this War Service Committee will be maintained, but if it is not, I think they deserve and, had I been here a year ago, I should have advised a vote of thanks from the Asso-

ciation for their efforts. We do not want to dwell too much on back history or ancient history, but the actions of your War Service Committee placed your industry and, particularly, your Association, in a position which was enjoyed by very few groups during the war activities. Mr. Norris was very earnestly complimented on the case experienced on the part of the destructive elements, namely, Conservation Boards, with which the furnace manufacturers of the country fell into the views of those committees and boards. They stood almost alone. There were one or two other industries who were almost alone as an industry in an immediate acceptance of the situation of those war boards. As I remember, the committee spent possibly a half an hour in drawing a schedule of their intentions and purposes for the War Industries Board, less than a half page long. This is what we will do and we will do it tomorrow. They kicked at nothing, they complained of nothing. At the same time industries were ruled as being more or less non-essential. Gentlemen, you can thank very heartily your War Service Committee when you realize the fact that production business was never ruled on. They were never told they could only manufacture thirty per cent. What it meant to you during the years of 1917 and 1918 and 1919, after the first few months, I think from about April up until the time the armistice was signed, is beyond realization, but your industry had never been shortened in its essential elements, and I think that a vote of thanks should be given to that War Service Committee for that, if nothing else. Every industry I can think of, short of that one that was making munitions for the army, was ruled as being more or less non-essential, except warm air production. I think that is quite a record.

Increased Cost of Operation.

Another thing that I had in mind that I think it is well for us all to realize very seriously is the cost of operation of our individual businesses for the year 1920. We are forbidden to talk price. The law tells us what we can do very plainly in regard to talking price to the extent that we cannot talk it at all, but I believe that we can leave this meeting after certain individual talks with our fellows with the very deep appreciation as to the conditions that this industry faces. We have in no way approached a level of sales prices which can be looked upon as in any way profiteering. I question very much if in the room there is a product represented which has moved up in price over a long period of time as much as eighty per cent. You can point to no other product, particularly a foundry product, that has moved in such narrow limits. We must recollect, of course, that in the early part of 1919 there were certain industries which were told they must reduce prices and the action of the steel institute after considerable consultation and conference with the government officials lowered certain prices, had a very bad effect on this industry as far as price level was concerned. A great many of us found the necessity of moving prices down from twenty or twenty-five, and, in one or two cases, thirty points. It is very true that has come back, but we are not yet on the cotton goods level or the machinery level, or the level of many lines of hardware. In fact, nearly every other thing that goes into a house has moved up far more in percentage than the heating apparatus and, while I do not want to be in the position of going to ajil for any suggestions, I do believe that it would behoove all of us to watch very closely the cost of our finished material for the first three months of 1920. We all know or, at least, we all think we know what labor has proven and is proving and what its result will be. We realize the fact that the success of each one of us depends upon production. Production is the limiting factor and your cost of operation in many cases will be sixty or seventy per cent more for the same amount of business as comparable formerly. Now, each one of us faces a shortened production. I do not like to say a limited production because I don't know, but a shortened production when compared with that amount of stuff that our sales organizations can sell and that production which your sales organization will ask of you is going to cost you a far larger amount of cash, and you must get it from somewhere, and there are many, many furnace manufacturers whose prices, I think, have not gone up enough to overcome that difference. I think that this Association is quite safe in earnestly advising, if they can so advise among themselves, a very careful study as to the decrease in production and its bearing on an increased cost. Further than that, with the limited production, if we can call it that, we have all, after many years of effort and co-operation, an old-line trade, the tradesman who does not leave you and come to me after five or six or seven years. He likes your service. He expects service from you. He has not capitalized heavy enough to carry a stock of goods, and he wants to buy this year on the same basis as he always has bought. He will come to you next fall and expect service. I think that we should study our physical capacity as being able to give him that service. I am very happy to see such a big attendance at our annual meeting, very happy also to note a few new people and hear of a few new members, and I hope that your forthcoming meetings will even be more successful and more happy than this one.

At the conclusion of Mr. Richardson's address, Jesse M. McHenry arose and said: "In harmony with Mr. Richardson's suggestion I move you that a rising vote of thanks or, at least, an expression of our appreciation, be manifested by rising in deference to the War Service and Reconstruction Committee for the perfectly wonderful work which they carried on for this organization."

The importance of the work already done and of the plans in course of achievement by the Warm Air Heater Committee of the National Association of Sheet Metal Contractors was outlined by George Harms of Peoria, Illinois, ex-President of that Association.

We all realize that the success of the furnace business depends on the installation. Merely the making of the furnaces and producing the tonnage of castings does not amount to anything if the furnace is not properly installed. It will not give the results that you expect of it. What I want to come to is this, that the National Association of Sheet Metal Contractors—we all realize the sheet metal men are the installers of furnaces—has a committee right now who are compiling data with reference to the installation of furnaces, building codes, and so forth, pertaining to this line, and our Secretary, Mr. Williams, has already written to a number and probably all of you requesting you to send all information of this nature that you may have regarding this to Mr. Langenberg. Mr. Langenberg and I are a committee of the National Association of Sheet Metal Contractors to prepare a report to be submitted to its meeting in Peoria next June. We realize that we have a task before us now to provide specifications that will cover the proposition in all parts of the country. As Mr. Langenberg wrote me at the time we were appointed, he thought it would be a good idea to buy a ticket to somewhere in the interior of China or some other far eastern country so that we could never get back until this matter was settled, and I answered that I approved the suggestion, and we would thrash it out when we were over there.

All I want to say is this, I would like to have everyone here that is interested, and you are all interested in furnace installation, send your dope regarding furnace installation, whatever you may have, or building codes covering the installation of furnaces, to Mr. Langenberg. It is our intention to take all this data and compile something that we will submit to the Association next June, and see whether we cannot prepare something that can be used, at least, in some parts of the country, if not universally. So, I hope that you will get your heads together and send in your building codes as you may have them anywhere, or if you have anything with regard to specifications for installation, send it on to Langenberg.

A. W. Glessner called for a vote of thanks to Professor Willard and his associates as follows: "Mr. Chairman, I do not believe that we ought to adjourn this afternoon without expressing our appreciation to Prof. Willard and his associates, and to the other gentlemen who have come here today and who have presented to us these very able papers, and I would move that an expression of appreciation be extended to them."

E. B. Langenberg seconded the motion.

President Wise said: "All those in favor of that motion will signify by rising. It is unanimous. Now, I am going to ask you to remain just a moment. A matter has been brought to my attention which I consider very important. It has been brought to my attention that our contract with the University of Illinois for the research work expires on October 1st, which is correct, and it has been suggested that we now take action towards continuing that work from the expiration of our present contract, which is October 1st, 1920, to our next annual meeting, which will be in April, 1921. That will extend it about six months. I will entertain any motion that you wish to make."

John Howard: "Mr. Chairman, I will make a motion to that effect."

E. B. Langenberg: "Second."

President Wise: "It has been moved and seconded that our contract with the University of Illinois be extended until our next annual meeting, or until the end of our fiscal year, April 1st, 1921. Are there any remarks?"

E. B. Langenberg: "Possibly Professor Willard could let us know whether he could secure the talent he was talking about this morning for that length of time. It is a very short period. Would it be possible, Professor Willard?"

A. C. Willard: "I really have no idea what they can do. The situation is extremely critical, as you probably all realize. Of course, if we have a contract which runs another year, we possibly may get hold of additional men to do the work. At the present time Mr. Day is the only man who is really giving full time to this work who is paid exclusively from the fund provided by your association for this work. It is possible that if you extend this contract for another year that we may be able to get a man to replace Mr. Pratt and assist Mr. Day. Professor Kratz can not give all of his time to the work. These gentlemen have turned out a tremendous amount of work. We will make every effort to get the man. I fear we will have to pay considerably more money than we have in the past to get a satisfactorily trained man to do this sort of thing for that limited time. These men, of course, realize this is a year's contract and there is nothing definite beyond that time. I am not sure that it is fair to the association to ask them to extend it beyond the time indicated. It is a very awkward situation in which we are placed. For that reason all I can say is that I will make every effort to get a satisfactorily trained man to carry on the work. Of course, we can get somebody, but owing to the fact that we have only a limited time I feel that we would be seriously handicapped if we were to undertake the work with an untrained man. Mr. Day came into the work absolutely untrained, but he has now developed a very satisfactory technique, his knowledge of the testing problem is as comprehensive as we can possibly wish for, but it is very difficult to procure another man. The man that we lost was trained in the work and he was a very valuable man in the investigation, and it will be a serious matter to duplicate him. Without question, there is not a man in the country who can fill his place. You cannot get these men over night. This country does not possess men of the caliber of Professor Kratz, Mr. Day and Mr. Pratt. (Applause.)

"Now, we will make every effort to fill the position as satisfactorily as we can. It will help some. There will be no chance of getting anybody for between now and October. That is out of the question. If we know where the funds are coming from, it is possible that we can get a man in there for a year."

E. P. Miller: "I was not going to say anything, but it has just occurred to me that there are a lot of people that ought to go to the University of Illinois. They have had the invitation time and time again, but very few have availed themselves of the opportunity. Several of the committee did go over there, and speaking for myself I enjoyed it so much, and got so much good out of it, that I think if the various members would take it upon themselves to go over there as individuals they will find that Mr. Day, Professor Kratz and Professor Willard will always be glad to see them, and it will help inspire them and inspire the association. I believe that we ought to go and we can not express our appreciation any stronger for the work they have been doing, and I think that we will be more enthusiastic than ever if more of us will look into it."

A. C. Willard: "Mr. Chairman, may I add again my urgent invitation to every member of the association to come to Urbana as often as he will come. We have had a great many visits the last year and we have enjoyed meeting the men, and all expressed themselves as very favorably impressed with what we were trying to do. To those who have been there, we say that we would like to have you come as often as you can, and to the others, we would like to have more of you. Of course, it has happened that at the time and some were there, we were extremely busy and we found it necessary to let them shift for themselves, and it may be necessary to do the same thing in the future, but if you will stay around I think you will pick up a great deal. Generally we can take care of you. The other day Mr. Dougherty called unannounced. He knew what he was looking at, and I guess he found out what he wanted to know. As a matter of fact, if you will give us a little notice, generally we can take care of you. You are welcome to come any time. Come as often as you will."

A motion was made and carried to divert to the Research Fund the money—over a thousand dollars—now lying idle in the advertising fund.

The Convention came to final adjournment at 5:30 o'clock Wednesday afternoon; and half an hour later the members gathered for the Annual Banquet in the Cleveland Hotel. D. Rait Richardson acted as toastmaster. An excellent menu was served. A foot-note on the bill of fare conveyed the highly exciting information that "Wines were omitted this year as distasteful to our members and guests. Your committee regrets the lack of proper humidity." The program of the entertainment was as follows:

Program of Entertainment.

D. Rait Richardson, Toastmaster.

Muisc .....Quartette and Orchestra
Address .....P. T. Giblin
Song.....Miss Marie Elvano
"The Furnace Manufacturer's Dream.....E. B. Langenberg
"The Enthusiasm of Sale".....Wiliam Ganson Rose
Music .....Orchestra
Song.....Miss Marie Elvano
Address .....Mr. Barker
Address.....W. P. Lamneck
Address .....Edward Norris
Address .....George Auer
Address .....E. F. Glove
Song.....Miss Marie Elvano
Nut Test—A special feature secured at great expense, conducted by Professor SMAILLIW. Protected by the Cleveland Police Force.
Impromptu ..... Everybody

Good-night—Come Again.

It would be difficult to exaggerate the courtesy, friendliness, good fellowship, and cleverness of the Entertainment Committee from Cleveland and its vicinity, consisting of E. S. Moncrief, chairman, W.

T. Strangward, W. D. Cover, E. C. Fox, O. L. Moon, F. R. Hutchinson, Charles Seelbach, Jr., T. E. Henry, H. F. Seymour, Fred C. Noll, and Charles LaMonte.

The Independent Register and Manufacturing Company of Cleveland, Ohio, had an exhibit in Room 9033 of the Cleveland Hotel during the Convention. In the exhibit were displayed the new Independent "Fabrikated" pipeless furnace gratings and register faces, thimbles, casing rings, and ventilators. Almost everyone in attendance at the Convention managed to find time to visit the exhibit before the day was over.

The Henry Furnace and Foundry Company of Cleveland, Ohio, manufacturers of "Moncrief" warm air heaters, distributed a very useful souvenir in the form of a genuine leather bill fold, which was appreciated by everyone at the Convention.

Special interest attached to the presence at the Convention of H. Burnison, Superintendent Furnace Department, the McClary Manufacturing Company, Hamilton, Ontario, Canada. Mr. Burnison is the only Canadian member of the National Warm Air Heating and Ventilating Association.

The reports of the Warm Air Furnace Research staff of the University of Illinois were made available through the courtesy of the University of Illinois. The text of the research work is ready for distribution in Bulletin 117, Engineering Experiment Station, University of Illinois, Urbana, Illinois, and copies may be had by addressing that department of the University.

URGES DEALERS TO PROFIT BY THE SPRING HOME BUILDING BOOM.

The Empire Pipeless Warm Air Heater, Made by the Co-Operative Foundry Company, Rochester, New York.

Long before the breaking out of the European conflict there was a housing shortage in this country which was estimated to be equivalent to a year's normal building production. That shortage was intensified during the war. It has not appreciably been diminished since the signing of the Armistice. It goes without saying, therefore, that under the drive of necessity there will be a great house building activity in every part of the land. High rents have forced many to consider the economy of owning homes. Thousands of mechanics who have been earning unusually large wages are in the market for homes. One of the first considerations in planning and building a home, after deciding upon the material and style of architecture, is the kind of heating plan to be installed. The question of relative efficiency and economy comes up for discussion. The warm air heater is cheaper and better than any other system. It is an easy matter to convince the prospective house owner of this fact. In a comparatively large number of instances where homes are of the bungalow type with large openings between most of the rooms, the pipeless warm air heater serves the purpose of both efficiency and economy. The dealer who recognizes these truths and who perceives the rapidly multiplying opportunities of widening his trade is requested by the Co-Operative Foundry Company, Rochester, New York, to consider the claims of the Empire Pipeless Warm Air Heater shown in the accompanying illustration and manufactured by this Company. The Co-Operative Foundry Company offers an agency proposition to dealers which is said to be unusually advantageous. In pursuance of the policy of cooperation which is embodied in the very title of the corporation, the Co-Operative Foundry Company works in closest harmony with its dealers in selling the Empire Pipeless Warm Air Heater and developing convincing arguments to meet local requirements. Explanatory circulars and catalogues may be had by writing to the Co-Operative Foundry Company, Rochester, New York, or to its Western Branch at 505 South Clinton Street, Chicago, Illinois.

MAKES PLANS FOR PLANT ADDITION.

Plans have been completed by the Thatcher Furnace Company, 41 Francis Street, Newark, New Jersey, for a one-story, 50x80 feet, addition to its plant, on Main Street in that city. Business expansion has rendered it necessary to enlarge the productive facilities of the company.

HAS CONICAL-SHAPED CASING TOP.

A selling argument which is very easy to understand in connection with a warm air heater is furnished in the conical-shaped casing top, said to be a special feature of the Rybolt Warm Air Heater, manufactured by the Rybolt Heater Company, Ashland, Ohio. This conical-shaped casing top, in conjunction with pipes entering at a 45 degree angle, throws the heat rapidly upward into the house. The warm air pipes leaving the casing top at a sharp angle—an angle which has the same slant or tangent as the descending sides of the cone—permit unobstructed exit to the warm air from the inner chamber of the heater. It seems reasonable to suppose, therefore, that the air thus warmed is carried away faster than would be the case when pipes leave the casing without the aid of such a cone and in a horizontal direction at the start. The Rybolt Warm Air Heater, series 200, is of all cast iron construction. It is equipped with a modern triangular grate and has a deep and commodious ash pit. The combustion chamber is corrugated outside and inside, allowing for all necessary expansion and increased radiating surface. Ample provision is made for proper humidity. Dealers and installers, who appreciate excellent material and construction, will do well to write for full particulars to the Rybolt Heater Company, Ashland, Ohio.

Make good your War Savings Stamps pledge.

PRACTICAL HELPS FOR THE TINSMITH

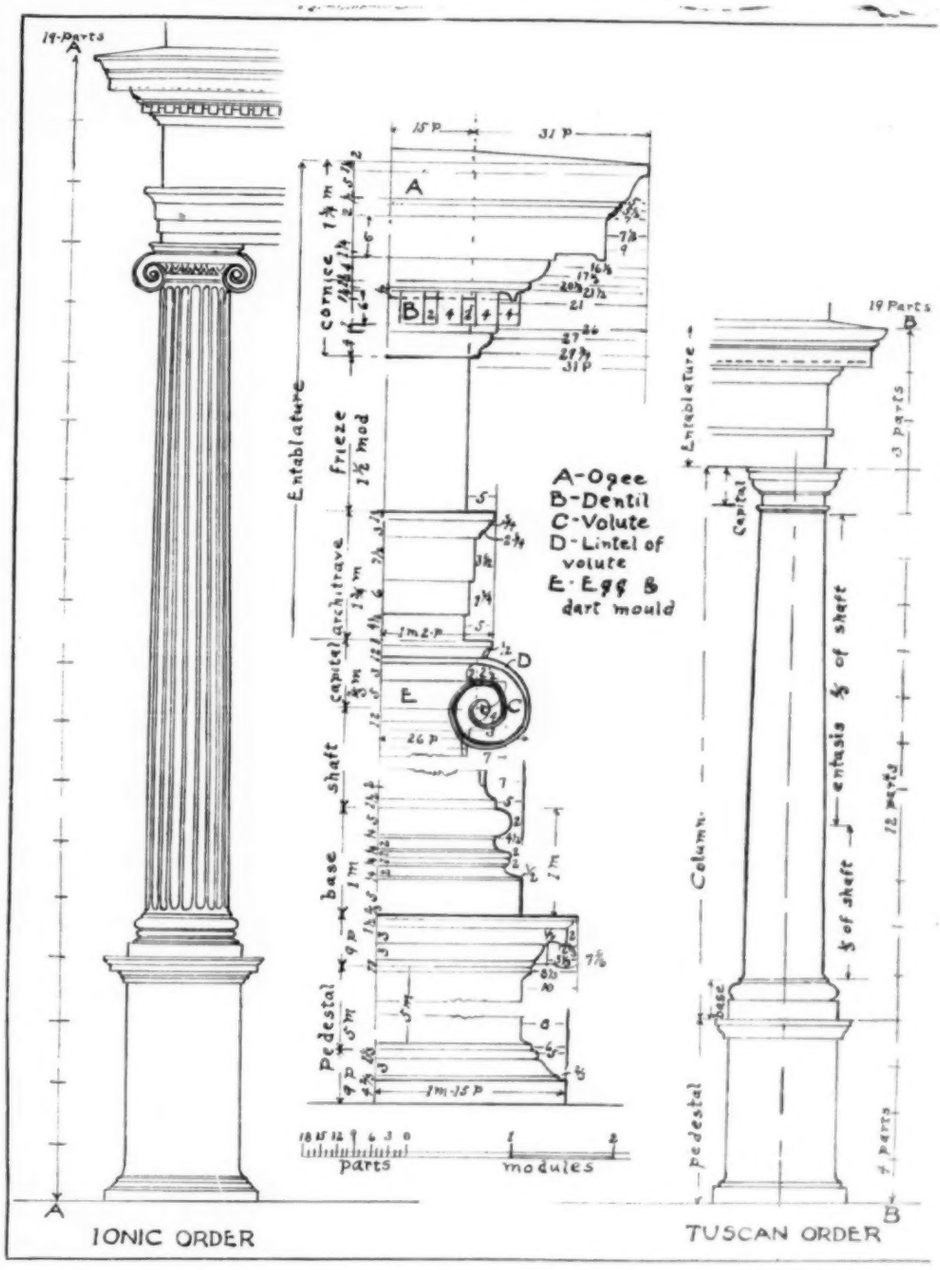
CORRECT CORNICE DETAILING.

By O. W. Kothe.

Architectural cornice work satisfies the artistic mind better than any other class of work. The more a man enjoys to see that which is graceful, and beautiful with lines that somehow fascinate the eye, the more we enjoy to have the opportunity of doing this work. We take a keen pride in it. We see that it is done uniformly, straight and durable. We somehow like to show the job to others, and a perfect stranger to our craft is taken up with it as much as we are.

In the future that is how we must look at cornice work. As we figure the job, let us feel deep in our hearts this is art. It must be executed perfectly, and as art it must bring me a good price or I can not offer to take it. Let the workmen feel e v e r y time they are engaged on this work, that this cornice is a public monument. It must be put up in its exact detail, neat, and durable to last a century.

We of today must get away from that c o l d commercial practice of looking at a cornice job as just so much flat sheet iron to be worked up, so much labor, and it should bring me so much money. Outside of that, it is never considered, less thought of, and still less looked at. Men of such attitude toward this great field of art, of public building operation; of work that has taken thousands of years to develop would better quite the field and take on specialties such as concrete columns, corrugated iron tanks, etc. Any coarse temperament enjoys that work equally as well as that which we call beautiful.



Correct Cornice Detailing.

Looking at our drawing, workmen of the above type seldom consider the make-up of an Ionic order. They take it as a matter of course. It's got to be that way. A student of fine mental qualities and fine perception, stops and looks at such designs. He considers what makes the effect so attractive; what makes light and shade, how the lines are grouped, what makes attractive moldings.

Considering the design still closer we see the Ionic order is made up of three main divisions, the pedestal, column, and entablature. Each of these is again subdivided, and each subdivision is made up of a series of members to make up a harmonious whole. We may

say an architectural order is much the same as a flower; it grows up and blooms, and remains in blossom as long as it stands. Therefore, it must be done well.

The proportion of each division is determined by dividing the opening or space from the side walk to the top of cornice line, into 19 equal parts. Allow 4 parts for the pedestal, 12 parts for column, and the remaining 3 parts for the entablature.

The column is the basis for further proportion. We next divide the height of column for the Tuscan order in 7 equal parts, the Ionic into 9 equal parts. One of these parts will represent the diameter of the lower part of shaft. Taking half this diameter we have the "Unit of Measure" and it is called the "Module." This module is divided into 18 equal parts, thereby spoken of as modules, and the division as parts.

Right here we should add, that there are five orders of architecture and the first four have different diameters for column.

The Tuscan order whose column is 7 inches in diameter.

The Doric order whose column is 8 inches in diameter.

The Ionic order whose column is 9 inches in diameter.

The Corinthian order whose column is 10 inches in diameter.

The Composite order whose column is 10 inches in diameter.

The module of the first two orders is redivided in 12 equal parts, and the latter three in 18 equal parts. With this scale, we proportion the rest of the order as pedestal, base, capital, shaft, architrave, frieze and cornice. The idea is to learn to make perfect designs That is where the design of each of the orders is highly important. It shows a person the relative proportion one member has to another.

Above our scale of modules, we have an enlarged view of detailing the Ionic order. This drawing is treated working from the center line of shaft. So the plinth of pedestal is 1 module 15 parts wide from the center line. Its full width would be 2 modules—16 parts. The height of plinth is 4 parts.

The next member ⅔ part high and ⅔ part shorter. The Ogee reverse is 3 parts high and 5 parts over from the edge of plinth. In this way the entire drawing is followed up, taking member by member and follow the module and its parts noted on the drawing. It is advised that the reader lay this Ionic order out, say, 4 feet high. It will be the most beautiful piece of drawing you ever did and something to be proud of.

Further attention is called to the Tuscan order with its notations. Notice by holding the diameters of shaft equal with Ionic order, it is much shorter. Observe it has less embellishments. Also note that moldings between the two orders do not correspond at all, hence the grave necessity of knowing architectural design. Nothing looks worse than for a draftsman to juggle molding around, regardless of order, position, or proportion.

Tradesman who would enjoy a full treatise of all the orders should request it.

GIVES PERSONNEL OF COMMITTEES OF THE WISCONSIN SHEET METAL CONTRACTORS' ASSOCIATION.

The newly elected president of the Master Sheet Metal Contractors' Association of Wisconsin, Paul L. Biersach, Milwaukee, Wisconsin, announces the following appointments of members to the various committees of the organization:

Legislative.

V. S. Kubly, Chairman, Madison; Henry Wernecke, Manitowoc; A. Kroupa, Racine; Edward Hoffmann, Milwaukee.

Industrial Education.

C. W. Pansch, Chairman, Racine; John B. Wallig, Kenosha; J. E. Schmidt, Sheboygan; Carl Anderson Racine; H. J. Schlegel, Appleton.

Educational.

Frank Romberger, Chairman, Milwaukee; O. P. Shlafer, Appleton; E. B. Tonnsen, Milwaukee.

Trades Relations and Policy.

O. A. Hoffmann, Chairman, Milwaukee; Fred Drews, Madison; Hugo Trilling, Sheboygan; John E. Murphy, Racine; N. A. McDonald, Fond du Lac.

Ways and Means.

John Bogenberger, Chairman, Milwaukee; Wm. Hammann, Milwaukee; Henry Pluckhan, Milwaukee; H. E. Hanson, Kenosha; Wm. Gehrke, Sheboygan.

Overhead-Burden Committee.

Otto Geussenhainer, Chairman, Sheboygan; C. F. Warning, Oshkosh; G. G. Jones, Racine; R. F. Jeske, Milwaukee.

Resolutions.

Louis Hoffmann, Chairman, Milwaukee; H. E. Bartelt, Milwaukee; H. B. Bartelson, Milwaukee; P. H. Henning, Platteville; Hans Limbas, Kenosha.

The first meeting of the new Board of Directors of the Master Sheet Metal Contractors' Association of Wisconsin will be held Wednesday, May 5, 1920, at which time plans will be perfected for increasing the service of the organization to its members and adding to its ranks by means of a vigorous campaign for membership.

USE PROVES ITS PRACTICABILITY.

There are many ventilators on the market. More than ordinary judgment is required to select the one best suited for the job. Some are of standard qualities. Many are inferior makes. The "Star" Ventilator, illustrated herewith, manufactured by the Merchant and Evans Company, Philadelphia, Pennsylvania, has been tried and tested, and according to many users, has proved practical in many circumstances and economical in the long run. This ventilator is made of galvanized steel. It can be had in copper or brass. Should other sheet metals be desired the requirements can be met. It is made to suit all conditions. No requirements are too exacting, declare the manufacturers. Its qualities fit it to give satisfaction in every instance where a ventilator is required.

According to the makers, the United States Government utilizes the "Star" ventilator in various engi-

neering departments. Sturdily built, this ventilator is storm proof. It is also weather tight. The Merchant and Evans Company, manufacturers of the "Star" Ventilators, say that it is to the benefit of the sheet metal contractor to become familiar with the qualities of its products. They will furnish the information free. This company manufactures a large line of sheet metal workers' supplies. A communication to the Merchant and Evans Company, Philadelphia, Pennsylvania, concerning the "Star" Ventilator will be promptly answered. Chicago branch, 347 North Sheldon Avenue.

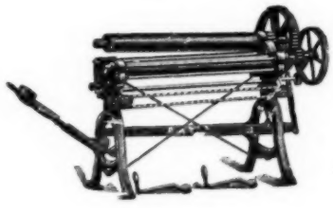
"Star" Ventilator, Made by the Merchant and Evans Company, Philadelphia, Pennsylvania.

FIRE DAMAGES THE PLANT OF BERGER MANUFACTURING COMPANY.

A telegram from Canton, Ohio, conveys the news that a fire broke out in the plant of the Berger Manufacturing Company of that city early Thursday morning, April 22nd. The fire was followed by an oil tank explosion. Fortunately the damage was not as serious as at first estimated. It was found upon lifting up the roof, which had caved in, that the machinery and equipment, were not harmed to any great degree. The Company is putting up a temporary roof and expects to have the plant running again Monday April 26th. There will be no interruption of its excellent service to its patrons and the loss of time will be speedily made up by the efficient system of workmanship which charaterizes the Berger Manufacturing Company.

FEATURES IN MACHINE REDUCE TIME AND LABOR OF FORMING.

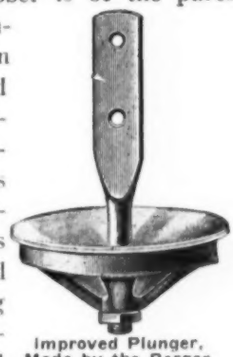
A machine is an evolution of a tool. It is designed to cut down labor and time in doing the work for which it is designed. If embodied in it are features which show an improvement over the general make of similar devices then its labor and time-saving qualities will be enhanced. In the accompanying illustration is shown a machine that is said to be designed to reduce the time and work necessary to form sheet metal. This machine is double geared. It can be changed very quickly to operate single geared for rapid work, when forming light sheets. A quick adjustable device for the rear roll, consisting of sprocket wheels and a chain permit regulations at both ends at the same time, or either end independently, as desired. The principle feature of the forming rolls made by this company is the automatic hinge for removing formed sheets. The hinge is counterbalanced and permits the operator to remove the formed sheets quickly from one position at the machine. When the hinge is closed the feed rolls return to their proper positions automatically. Therefore, these machines are self-opening, self-closing, and self-adjusting. The rolls are forged steel. The frame and gears are made of extra strong semi-steel. Bertsch and Company can furnish Forming Rolls in all standard sizes. No matter what the proportions of the machine ordered, in them will be embodied all the features characteristic of the accuracy of this company. For further information write to Bertsch and Company, Cambridge City, Indiana, and inquire for Catalogue "F."



50-Inch Forming Roll, Made by Bertsch and Company, Cambridge City, Indiana.

PUTS GOOD MATERIALS IN PLUNGERS.

Among the many tinner's and roofer's supplies the Berger Brothers Company, Philadelphia, Pennsylvania, manufactures the Improved Plunger, depicted herewith. In making these plungers this company uses the very best materials only. The metal is of the highest grade and the rubber is of the purest quality. All sizes of the Improved Plunger are always in stock and can be supplied promptly upon notice. An all-leather plunger is also manufactured by the Berger Brothers Company. This plunger is mainly adapted to boat pumps. It is made of thick, heavy leather and will last an uncommonly long time. The metal parts are securely riveted to the leather and will not rip off because of vigorous use. The leather plunger is conical in shape. Besides these plungers, this company manufactures a high-grade line of sheet metal contractors' supplies. Among other things, the Company makes: Tin and Terne plates, galvanized steel sheets, sheet zinc, sheet lead, copper cornices, skylights, ventilators, tinner's tools, pipe fasteners, and other products necessary for the tinner and roofer. In each of the articles enumerated, only the best of materials enters. Careful selection is exercised. Inquiries about the products made by this company should be directed to the Berger Brothers Company, 229-237 Arch Street, Philadelphia, Pennsylvania.



Improved Plunger, Made by the Berger Brothers Company, Philadelphia, Pennsylvania.

PRODUCES GOOD WORKMANSHIP.

For all soldering purposes, except for aluminum, Alfred Spice Process Non-acid Soldering fluid, manufactured by the Alfred Spice Process, 68 North Second Street, Philadelphia, Pennsylvania, can be used to produce good workmanship. This soldering fluid can be had in paste-salt and liquid. In either state it is pure, and will perform the work in a satis-

factory manner. There is no waste when Alfred Spice Process Non-acid Soldering Fluid is used. Each drop or grain is made use of. The soldering done when this composition is employed is clean and firm. Being free from any unclean ingredients, Alfred Spice Process Non-acid Soldering Fluid does the work quickly. Every portion of the soldering fluid manufactured by the Alfred Spice Process is uniform. When a supply of this fluid is ordered it can be relied upon to produce the same results as was obtained from a former batch. For samples or information write to the Alfred Spice Process, 68 North Second Street, Philadelphia, Pennsylvania.

SECURES FACTORY MANAGER THROUGH AMERICAN ARTISAN.

To American Artisan and Hardware Record:

Please discontinue our want advertisement for factory manager, as we have procured a man for this position through the advertisement in your publication.

Very truly yours,
Lichty Metal Products Company.

Waterloo, Iowa, April 20, 1920.

NOTES AND QUERIES.

Stock Drinking Fountains.

From Noble Sheet Metal Works, 119 South Stevens Street, Rhinelander, Wisconsin.

We would like to know who manufactures individual stock drinking fountains for stable use with cover on that will work on city pressure.

Ans.—Western Manufacturing Company, Oskaloosa, Iowa; Sterling Foundry Company, Sterling, Illinois; Novelty Iron Works, Sterling, Illinois; Gedge Brothers Iron Roofing Company, Anderson, Indiana.

Copper Tubing.

From Otto Schuman, Grand Rapids, Wisconsin.

Where can I buy copper tubing?

Ans.—A. C. Dallas and Son, 223 North Jefferson Street; Purvin Metal Products Company, 53 West Jackson Boulevard; and Charles H. Besly and Company, 118 North Clinton Street; all of Chicago, Illinois.

Round Steel Rope.

From J. Oscar Smith, 537 Reed Street, Moberly, Missouri.

Please advise where I can purchase round steel rope made out of material like iron tiller rope but woven perfectly round like window sash cord.

Ans.—American Steel and Wire Company, 208 South La Salle Street; Fischer and Hayes Rope and Steel Company, 741-45 West Van Buren Street; both of Chicago, Illinois.

Manufacturers of Metal Roofing.

From The Chatfield Manufacturing Company, 300 Commonwealth Trust Building, St. Louis, Missouri.

Kindly give us the names of manufacturers of metal roofing.

Ans.—American Sheet and Tin Plate Company, Frick Building, Pittsburgh, Pennsylvania; Berger Manufacturing Company, Canton, Ohio; Brier Hill Steel Company, Youngstown, Ohio; W. J. Burton Company, Junction and Federal Streets, Detroit, Michigan; Inland Steel Company, First National Bank Building, Chicago, Illinois; Merchant and Evans Company, 2035 Washington Avenue, Philadelphia, Pennsylvania; Milwaukee Corrugating Company, Milwaukee, Wisconsin, Stark Rolling Mill Company, Canton, Ohio; Sykes Company, 930 West 19th Place, Chicago, Illinois; Whitaker Glessner Company, Wheeling, West Virgina.

Address of Henry Disston and Sons.

From Edward Schuler, Pearl City, Illinois.

Can you furnish me with the address of Henry Disston and Sons?

Ans.—Henry Disston and Sons, Incorporated, are located in Philadelphia, Pennsylvania.

Sun Dials.

From E. F. Clark, 1426 South Carr Street, Sedalia, Missouri.

I would like to know where I can purchase sun dials for lawns.

Ans.—Adolph M. Jordan, 37 East 5th Avenue, Cincinnati, Ohio; Rostand Manufacturing Company, Milford, Connecticut.

Weather Vanes.

From E. F. Clark, 1426 South Carr Street, Sedalia, Missouri.

Please advise who manufactures weather vanes for lawns.

Ans.—Milwaukee Corrugating Company, Milwaukee, Wisconsin; Gerock Brothers Manufacturing Company, 1252 South Vandeventer Avenue, St. Louis, Missouri, Edward Manufacturing Company, 545 Eggleston Avenue, Cincinnati, Ohio; Friedley Voshardt Company, 733 South Halsted Street, Chicago, Illinois.

Three Ring Plant Supports.

From E. F. Clark, 1426 South Carr Street, Sedalia, Missouri.

Where can I buy three ring plant supports.

Ans.—New York Wire Lamp Frame Company, 1132 South Wabash Avenue, Chicago, Illinois.

Ladder Jacks.

From Sam Tomkins, 210 Park Street, Denison, Iowa.

Can you tell me where I can get ladder jacks to aid in eaves trough work?

Ans.—Bettcher Stamping and Manufacturing Company, 6120 Clark Avenue, Southwest, Cleveland, Ohio; Steel Scaffolding Company, Evansville, Indiana; T. C. Krewson, 801 Master Street, Philadelphia, Pennsylvania.

Portable Grinding Machines.

From Sam Tomkins, 210 Park Street, Denison, Iowa.

Kindly inform me who makes a grinding machine such as professional scissor grinders carry.

Ans.—Covell Manufacturing Company, Benton Harbor, Michigan; Baldwin, Tuthill and Bolton, Grand Rapids, Michigan; Shawmut Machinery Company, 82 Lincoln Street, Boston, Massachusetts.

Nail Making Machinery.

From Alexander Filshie, 5606 State Street, Chicago, Illinois.

Kindly give me the names of manufacturers of nail making machinery.

Ans.—William Glader, 210 North Ann Street, Chicago, Illinois; National Machinery Company, Tiffin, Ohio; Cleveland Machine and Manufacturing Company, 4944 Hamilton Avenue, Cleveland, Ohio; Walton and Macke Nail Company, Kokomo, Indiana, and Turner, Vaughn and Taylor Company, Cuyahoga Falls, Ohio.

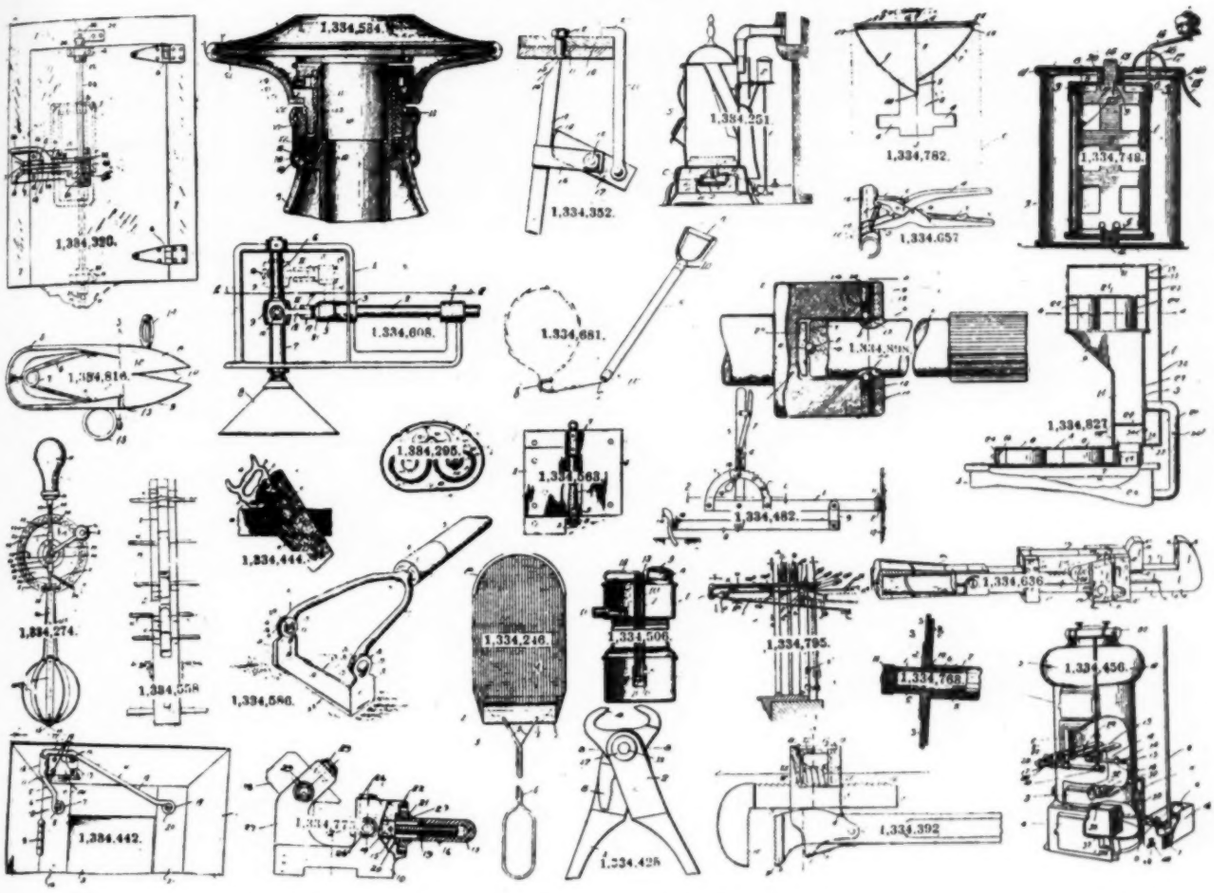
"Brightest and Best" Oil Stoves.

From Nichols Company, Burlington, Iowa.

Who manufactures the "Brightest and Best" oil stoves?

Ans.—These stoves were formerly made by the Glazier Stove Company, Chelsea, Michigan, now out of business.

NEW PATENTS.



1,334,246. Fly-Swatter. Benjamin F. Kelso, Hemet, Calif. Filed June 12, 1919.

1,334,251. Fuel Feeder and Cut-Off. Curtis C. Lillibridge, Hutchinson, Kans. Filed Nov. 3, 1919.

1,334,274. Egg-Beater. George E. Alexander, New York, N. Y. Filed June 26, 1919.

1,334,295. Razor-Blade Sharpener. George G. Floyd, Riverside, Ill. Filed Aug. 18, 1917.

1,334,320. Door Latch and Locking Apparatus. Frederick Schmidgall, Cincinnati, Ohio. Filed March 31, 1919.

1,334,352. Bolt-Holder. William J. Dehn, Blenker, Wis. Filed Oct. 20, 1919.

1,334,392. Wrench. Harry Lumpkin Osment, Cartersville, Ga. Filed June 26, 1918.

1,334,425. Combination-Tool. Henry G. Wernimont, Washington, D. C. Filed Jan. 22, 1919.

1,334,442. Door-Support. Louis T. Eanes, Selma, Ala. Filed July 23, 1919. Serial No. 312,740.

1,334,444. Saw-Handle. Dwight W. Fulton, Davenport, Iowa. Filed June 6, 1919.

1,334,456. Oil-Burner. Thomas B. Jarvies, Kansas City, Mo. Continuation in part of application Serial No. 253,703, filed Sept. 12, 1918. This application filed May, 12, 1919.

1,334,482. Combination Lock and Jack. William Franklin Brittain, Troup, Tex., assignor of one-half to Jacques E. Blevins, Houston, Tex. Filed May 5, 1919.

1,334,506. Valve Device for Acetylene-Lamps and the Like. George R. Shanklin, Springfield, Ill. Filed May 24, 1918.

1,334,534. Adjustable Razor-Blade Guard. Hugo S. Hasselquist, Oak Park, Ill., assignor to Collins Rotary Safety Razor Company, Chicago, Ill., a corporation of South Dakota. Filed Nov. 24, 1919.

1,334,558. Fencepost. Sanford D. Sanders, Island City, Oregon. Filed April 14, 1919.

1,334,563. Hinge. Lawson B. Shelton, Los Angeles, Calif. Filed April 26, 1919.

1,334,586. Garden-Weeder. Charles Ely Baker, Roodhouse, Ill. Filed Oct. 31, 1917.

1,334,608. Washing-Machine Mechanism, Clarett B. Greeson, Cedar Falls, Iowa. Filed April 17, 1919.

1,334,636. Wrench. Armstrong P. Rinehart. Los Angeles, Calif. Filed Sept. 9, 1919.

1,334,657. Hose-Clamping Tool. Charles E. Kent, Los Angeles, Calif., assignor of one-tenth to Walter L. Bowers, Los Angeles, Calif. Filed Aug. 26, 1919.

1,334,681. Garden Implement. Dennis Shea, North Adams, Mass. Filed April 5, 1919.

1,334,748. Ice-Cream Freezer. John C. Gibbs, Lancaster, Pa. Filed Aug. 15, 1919.

1,334,763. Fish-Reel. Samuel L. Kuntz, Fort Wayne, Ind. Filed Feb. 10, 1919.

1,334,775. Tool-Holder. Joseph H. Mason, East Providence, R. I. Filed July 17, 1919.

1,334,782. Can-Opener. Patrick Mullane, East Moline, Ill. Filed Jan. 27, 1919.

1,334,795. Safety Clothesline Attachment for Windows. Louise E. Ringelstein, New York, N. Y. Filed April 5, 1919.

1,334,816. Gathering-Shears. Albert G. Stone, Rustburg, Va. Filed June 26, 1918.

1,334,827. Heating Attachment. Ira G. Yost, Reading, Pa. Filed Sept. 4, 1918.

1,334,839. Fishhook-Grapple. Perry A. Cole, Elizabethtown, N. Y. Filed April 30, 1919.

KNOW YOUR STAND AT END OF DAY.

Do you realize the most successful merchants are the ones who know how much is owing them at the close of every day? Such information was thought impossible a few years ago, and even today there are many who still have doubts about obtaining it in a simple manner. But the successful merchant is getting it just the same, and he is not paying a big price for it either, although such figures are worth every cent they cost, and more too for that matter.

WEEKLY REPORT OF TRADE AND THE MARKETS

STEEL TRADE IS MARKING TIME IN THE MATTER OF BOOKING ORDERS.

The steel industry is marking time on account of the railroad strike now practically at an end. Some big steel companies report that their books are crowded with orders for future delivery and they are declining many large ones until they are sure that the carriers can move the tonnage as the orders come due. Producers are not looking for any prolonged period of curtailed operations but are making sure that the end is in sight before committing themselves further. On the other hand the leading interest continues to book further orders for its regular customers although its March statement showed an increase in unfilled orders amounting to 289,994 tons, or bookings amounting to 124 per cent of capacity. The independents are booked up to a less extent, some for a few weeks ahead and others for a small part of their third quarter output.

It is believed that there is enough coke available once the strike is broken and that prompt shipments will save many furnaces from serious curtailment of output. However, it is reported that all the machine-drawn beehive ovens in the Connellsville district were down. Over fifty per cent of the iron and steel industry in this district is paralyzed. Manufacturers in the Mahoning and Shenango Valleys are wholly shut down. Most of the iron and steel works in the Wheeling-Steubenville district are operating, but not a pound of the finished products are being moved.

While it is reported that some of the distributing yards are reasonably clear of loaded cars, this is by no means a general condition and with the siding of all lines heavily encumbered it is expected that the freight yards will quickly become congested with a resumption of traffic. In fact it will take several weeks to correct the condition of congestion the carriers have been thrown into by the strike and embargoes against a number of important steel making centres will be necessary in order that the rush of material forward will not cause a more serious congestion.

While it can be said definitely that the strike is broken in certain sections it is still in force in other parts. The worst phase of it is that it is not an organized strike which can be dealt with through one group of heads but a collection of groups with no relation to each other. It therefore makes it necessary to deal with each group separately and no concerted action by the employers is possible, as would be the case in an organized strike.

STEEL.

Inquiries from car builders, shipyards and railroads continue to pour in. The New York Central has placed an order for 206 locomotives and will purchase 1,800 stock cars in addition to the order placed by them a week or two ago for 8,000 cars. The Pennsylvania railroad is in the market for 7,000 tons of plates and shapes for repairs on rolling stock and the Baltimore and Ohio has put out inquiries for an additional 2,100 car bodies. Other roads which are receiving bids on locomotives are the Boston and Maine, Southern Pacific, Missouri Pacific, St. Louis and San Francisco, Northern Pacific and the Des Moines terminal railroad. The Louisville and Nashville reports that the new series "B" equipment trust bonds were not issued but that instead they had entered into an agreement with the Director General and the Guaranty Trust Company of New York for issues of equipment trust notes to be purchased by the Director General. The amount of this issue has not been determined but will probably be in the neighborhood of $10,500,000.

COPPER.

Resumption of shipments from the West to the refineries in the East is the most notable recent feature in the copper industry, and the market remains dull and weak in all branches. An increase in shipments next month would probably offset to a great extent the shortage sure to develop from interrupted traffic, which some put at one-third of the month's consumption.

Business in copper temporarily is almost entirely suspended and the tone of the market is easier here and abroad although prices of refined are without essential change. The largest producers see no necessity to make concessions as nothing is to be gained by an effort to sell on an unwilling market.

Consumers naturally have bought little copper in the last few weeks because of their previous heavy purchases on contracts covering the next three or four months. Producers report almost no demand at the moment but they continue to hold prices firmly for shipment up to July or August. Some of them are asking higher prices for later shipments but there is no demand and prices are purely nominal.

Production of refined copper in this country during the last three months is estimated to have averaged close to 120,000,000 pounds, but the prospect is that there will be a sharp reduction in refinery output during the current month. The transportation situation is still serious and very little copper is being shipped or material received from western smelters. This fact alone should have a strengthening rather than a reverse effect upon the market.

One interesting development is the revival in the demand for casting copper in the outside market within the last few days with inquiries coming largely from railroad equipment manufacturers. The supply

of casting copper is relatively light and temporarily is bringing as much as electrolytic. Manufacturers find it difficult to obtain scrap and for the little sold as high as 17¾ and 18 cents is being asked.

TIN.

Price variations continue to characterize the tin market in response to London fluctuations. Early in the week, London quotations underwent an increase. The advance was believed to be due to the news that the "outlaw strike" of the switchmen on American railroads was a failure. Tin being the only metal which we buy from England, it was natural that the news should stiffen the London tin market. But although the strike is a failure our consuming interests will for several weeks suffer from the congestion and demoralization of traffic caused by the strike.

LEAD.

Orders from consumers are below the normal average in the lead market on account of the disturbed conditions of freight and the unsettled state of the market.

SOLDER.

No further advance in the prices of solder has taken place in the Chicago market. The present quotations are as follows: Warranted, 50-50, per pound, 41 cents; Commercial, 45-55, per pound, 38.30 cents; and Plumbers', per pound, 35.60 cents.

ZINC.

The domestic zinc market is dull, with a slight decline in prices. Little trading is being done, chiefly because of interrupted transportation. High prices have been paid, especially for Grade A, for metal actually in the East, within immediately available range. But the general market prices can hardly be expected to improve under the disturbed traffic conditions.

In the Chicago market, zinc in slabs had declined from 9½ to 9 cents per pound.

TIN PLATE.

The sheet and tin plate mills in the Youngstown district were affected least of all by the railroad strike but accumulation of finished product is now hampering their operation decidedly.

The difference in position, as to prices, between the independent tin plate makers and the independent sheet makers, is as great as possible, now that the circumstance arises of the leading interest having opened its books, April 13th, for second half contracts with manufacturing consumers and third quarter contracts with jobbers, at Industrial Board prices.

The independent tin plate makers, as a rule, will adhere to the Pittsburgh base price for tin plate, as they did in the case of contracts for the present half year. There were some departures then, and there will be somewhat more now. It is believed that at any rate consumers who buy from both the leading interest and the independents will get the $7.00 price from the latter, also consumers who are directly in competition with leading interest's customers. Two or three of the independents will probably save portions, perhaps large portions, of their capacity to take advantage of such spot market as may exist. Of late the spot market has been very high.

SHEETS.

In consonance with the law of supply and demand, a further increase has occurred in the Chicago market, amounting to 50 cents per hundred pounds on One Pass Cold Rolled Black sheets, and 25 cents per hundred pounds on galvanized sheets.

Opening of the books of the leading interest for last half business took place last week, but no figures as to the amount of tonnage that will be available have been given out, but the general impression is that the carry-over of first half business will not amount to much more than a month's output, and the assumption is that the tonnage to be allotted will be fairly heavy. Rumors have been current that the leading interest contemplated imposing a higher price on open hearth than on bessemer steel, but this is officially denied and it is stated that the company will make no change from the March 21 schedules, either as regards base prices, extras or differentials.

OLD METALS.

Scrap iron and steel dealers in the Chicago market have felt the full effect of the strike by the railroad yardmen, as it has been practically impossible to move any material in the Chicago switching district. One feature of the situation is that considerable money is tied up in the tonnage held on railroad tracks.

Wholesale quotations in the Chicago district which may be considered nominal are as follows: Old steel axles, $33.00 to $34.00; old iron axles, $38.00 to $39.00; steel spring, $26.00 to $27.00; No. 1 wrought iron, $27.00 to $28.00; No. 1 cast, $37.50 to $38.50; all net tons. Prices for non-ferrous metals are as follows, per pound: Light copper, 14 cents; light brass, 9 cents; lead, 6½ cents; zinc, 5½ cents; cast aluminum, 22½ cents.

PIG IRON.

Prompt deliveries of iron were almost impossible to obtain during the strike and are by no means easy now, but the market in futures remained active and a larger tonnage for last half delivery was booked last week than for several weeks prior.

It is reported from the Pittsburgh district that although no shipments are being made, buying and selling continues much as ever. More future business is being booked in proportion than sales of prompt tonnages. Some talk of a runaway market in prompt tonnage upon the resumption of transportation is heard. But others argue that many of the steel companies still have a surplus of iron.

Inasmuch as pig iron is the fundamental material in an enormous percentage of the finished products of American industry, its price may rightly be said to be among the most important of the factors which determine the cost of a vast number of commodities entering into commerce.

Current Hardware and Metal Prices.

AMERICAN ARTISAN AND HARDWARE RECORD is the only publication containing Western Hardware and Metal prices corrected weekly.

METALS

PIG IRON.

Basic	$43 00
Southern Fdy. No. 2	46 60
Lake Sup. Charcoal	57 50-60 50
Malleable	43 50

FIRST QUALITY BRIGHT TIN PLATES.

			Per box
IC	14x20	112 sheets	$15 80
IX	14x20		17 75
IXX	14x20		19 45
IXXX	14x20		20 90
IXXXX	14x20		22 15
IC	20x28		31 60
IX	20x28		35 50
IXX	20x28		38 90
IXXX	20x28		41 80
IXXXX	20x28		44 30

COKE PLATES.

Cokes, 180 lbs.	20x28	$19 80
Cokes, 200 lbs.	20x28	20 00
Cokes, 214 lbs. IC	20x28	20 70
Cokes, 270 lbs. IX	20x28	24 00

BLUE ANNEALED SHEETS.

No. 10 per 100 lbs.	$5 27
No. 12 per 100 lbs.	5 32
No. 14 per 100 lbs.	5 37
No. 16 per 100 lbs.	5 45

ONE PASS COLD ROLLED BLACK.

No. 18-20 per 100 lbs.	$7 80
No. 22-24 per 100 lbs.	7 85
No. 26 per 100 lbs.	7 90
No. 27 per 100 lbs.	7 95
No. 28 per 100 lbs.	8 00
No. 29 per 100 lbs.	8 10

GALVANIZED

No. 16 per 100 lbs.	$8 75
No. 18-20 per 100 lbs.	8 90
No. 22-24 per 100 lbs.	9 05
No. 26 per 100 lbs.	9 20
No. 27 per 100 lbs.	9 35
No. 28 per 100 lbs.	9 50
No. 30 per 100 lbs.	10 00

WELLSVILLE POLISHED STEEL

No. 18-20 per 100 lbs.	$9 65
No. 22-24 per 100 lbs.	9 75
No. 26 per 100 lbs.	9 85
No. 27 per 100 lbs.	9 95

KEYSTONE HAMMERED POLISHED STEEL

Discontinued. New product will be announced later.

BAR SOLDER

Warranted,	
50-50 per 100 lbs.	$41 00
Commercial,	
45-55 per 100 lbs.	38 30
Plumbers' per 100 lbs.	35 60

ZINC.

In slabs	9½c

SHEET ZINC.

Cask lots	14 c
Less than cask lots	14¼-14½c

COPPER.

Copper Sheet, base	29½c

LEAD

American Pig	9 75
Bar	10 00
Sheet.	
Full coils per 100 lbs.	$12 65
Cut coils per 100 lbs.	12 90

TIN.

Pig tin	68½c
Bar tin	70 c

HARDWARE

ADZES.

Carpenters'.
Plumbs ..... Net

Coopers'.
Barton's ..... Net
White's ..... Net

Railroad.
Plumbs ..... Net

AMMUNITION.

Shells, Loaded, Peters.
Loaded with Black Powder, ... Less 18%
Loaded with Smokeless Powder, medium grades, ... Less 18%
Loaded with Smokeless Powder, high grade, Less 18%

Winchester.
Smokeless Repeater Grade, ... Less 15%
Smokeless Leader Grade ..... Less 15%
Black Powder ..... Less 15%

U. M. C.
Nitro Club 18%
Arrow 18%
New Club 18%

Gun Wads—per 1000.
Winchester 7-8 gauge 10&7½%
" 9-10 gauge 10&7½%
" 11-28 gauge 10&7½%

Powder	Each
DuPont's Sporting, kegs	$11 25
" " ¼ kegs	3 10
DuPont's Canisters, 1-lb	56
" Smokeless, drums	43 50
" " kegs	22 00
" " ¼ kegs	5 75
" " canisters	1 00
Hercules "E.C." and "Infallible", 50 can drums	43 50
Hercules "E.C.", kegs	22 50
Hercules "E.C.", ½-kegs	11 25
Hercules "Infallible", 25-can drums	22 00
Hercules "Infallible," 10 can drums	9 00
Hercules "E.C.", ¼-kegs	5 75
Hercules "E.C." and "Infallible", canisters	1 00
Hercules W. A. .30 Cal. Rifle, canisters	1 25
Hercules Lightning Rifle, canisters	1 25
Hercules Sharpshooter Rifle, canisters	1 25
Hercules Unique Rifle, canisters	1 50
Hercules Bullseye Revolver, canisters	1 00

ANVILS.

Solid Wrought ..... 23 & 23½ per lb.

ASBESTOS

Board and Paper, up to 1/16"	17c per lb.
Thicker	18c per lb.

AUGERS.

Boring Machine ..... 40 & 40&10%
Irwin's 25%
Carpenter's Nut 50%

Hollow.
Bonney's ..... per doz. 30 00

Post Hole.
Iwan's Post Hole and Well ..30%
Vaughan's, 4 to 9 in. ..... per doz. $14 00

Ship.
Ford's, with or without screw ..... Net list

AWLS.

Brad.

No. 3 Handled	per doz.	$0 65
No. 1050 Handled	"	1 40
Shouldered, assorted 1 to 4,	per gro.	4 00
Patent asst'd, 1 to 4	"	85

Harness.

Common	"	1 05
Patent	"	1 00

Peg.

Shouldered	"	1 60
Patented	"	75

Scratch.
No. 18, socket handled ..... per doz. 2 50
No. 344 Goodell-Pratt, List, less 35-40%
No. 7 Stanley ..... " 2 25

AXES.

First Quality, Single Bitted, 3 to 4 lb., per doz. 15 50
First Quality, Double Bitted ..... per doz. 20 50

Broad.
Plumbs, West, Pat ..... List
" Can. Pat $69 00
Firemen's (handled), ... per doz. 21 00

Single Bitted (without handles).
Prices on
Warren Silver Steel ..application
Warren Blue Finished "

Double Bitted (without handles).
Warren's Natl. Blue, 3½ to 4½ lb. ..Prices on application
The above prices on axes of 3 to 4 lbs. are the base prices.

BAGS, PAPER NAIL.

Pounds	10	16	20	25
Per 1,000	$5 00	6 50	7 50	9 00

BALANCES, SPRING.

Sight Spring ..... Net
Straight ..... Net

BARS, CROW.

Pinch or Wedge Point, per cwt. ..... $8 00 to $9 00

BASKETS.

Clothes.

Small Willow	per doz.	15 00
Medium Willow	"	17 00
Large Willow	"	20 00

Galvanized	1 bu.	1½ bu.
Per doz.	$16 08	$18 72

BEATERS.

Carpet.	Per doz.
No. 7 Tinned Spring Wire	$1 10
No. 8 Spring Wire copper	1 50
No. 9 Preston	1 75

Egg.	Per doz.
No. 50 Imp. Dover	$1 10
No. 102 " " Tinned	1 35
No. 150 " " hotel	2 10
No. 10 Heavy hotel tinned	2 10
No. 13 " " "	3 30
No. 15 " " "	3 60
No. 18 " " "	4 50

Hand	8	9	10	12
Per doz.	$11 50	13 00	14 75	18 00

Moulders'.
12-inch ..... Per doz. 20 00

BELLS.

Call.
3-inch Nickeled Rotary Bell, Bronzed base ..per doz. $5 50

Cow.
Kentucky 30%

Door.	Per doz.
New Departure Automatic	$7 50
Rotary.	
3 -in. Old Copper Bell	6 00
3 -in. Old Copper Bell, fancy	8 00
3 -in. Nickeled Steel Bell	6 00
3½-in. Nickeled Steel Bell	6 50

Hand.

Hand Bell polished. List plus		15%
White Metal	"	15%
Nickel Plated	"	5%
Swiss	"	10%

Miscellaneous.
Church and School, steel alloys 30%

Farm, lbs	40	50	75	100
Each	$3 00	3 75	5 50	7 25

BEVELS, TEE

Stanley's rosewood handle, new list ..... Nets
Stanley iron handle ..... Nets

BINDING CLOTH.

Zinced 55%
Brass 40%
Brass, plated 60%

BITS.

Auger.
Jennings Pattern ..... Net
Ford Car ..... List plus 5%
Ford's Ship ..... " " 5%
Irwin 35%
Russell Jennings ..... plus 20%
Clark's Expansive 33⅓%
Steer's " Small list, $22 00..5%
" " Large " $26 00..5%
Irwin Car 35%
Ford's Ship Auger pattern Car ..... List plus 5%

Center 10%

Countersink.

No. 18 Wheeler's	per doz.	$2 25
No. 20 "	"	3 00
American Snailhead	"	1 75
" Rose "	"	2 00
" Flat	"	1 40
Mahew's Flat	"	1 60
" Snail	"	1 90

Dowel.
Russell Jennings ..... plus 20%

Gimlet.
Standard Double Cut Gross $8 40
Nail Metal Single Cut ..... Gross $1 00—$5 00

Reamer.

Standard Square	Doz.	2 50
American Octagon	"	2 50

Screw Driver.

No. 1 Common	40
No. 26 Stanley	75

BLACKING, STOVE. (See Polish)

BLADES, SAW.

Butchers'.
Standard, ¾ & 1½-in.....Nets
Clock Spring..... "
Star..... "

Hack.
Atkins.....5%
Star.....Nets

Wood.
Disston

Nos.	6	66	26
	$8 00	$8 50	$8 00

Atkins

Nos.	2	14	18
	$3 85	$6 50	$4 75

BLOCKS.

Wooden.....20%
Patent.....20%

BOARDS.

Stove.
Wabash Crystal.....Net Prices
Wabash Art Inlay..... "
Wabash Embossed..... "

Wash.
No. 760, Banner Globe, single) .....per doz. $5 25
No. 652, Banner Globe, (single) .....per doz. 6 75
No 801, Brass King.. " 8 25
No. 860, Single—Plain Pump 6 25

BOLTS.

Carriage, Machine, etc.
Carriage, cut thread, ¾x6 and sizes smaller and shorter..40&10%
Carriage, sizes larger and longer than ¾x6 ..... 20%
Machine, ¾x4 and sizes smaller and shorter.....50&10%
Machine, sizes larger and longer than ¾x4 ..... 15%
Stove 70%
Tire.....60%

Mortise, Door.
Gem, iron..... 5%
Gem, bronze plated..... 5%

Barrel.
Cast.....Nets
Wrought..... "
Wrought, bronzed..... "

Flush.
Wrought..... "

Spring.
Wrought..... "
Wrought, heavy..... "

Square.
Wrought..... "

BORERS.

Angular.
Miller's Falls.....per doz. $23 00
Sill borers, No. 51... " 34 00
" " 52... " 39 50

Bung. Doz.
Enterprise Mfg. Co.'s No. 1....10%
" " " No. 2....10%

BOXES.

Mail, No..... 2 4 10
Per doz..... $18 00 23 00 29 00

Mitre.
Stanley's.....Net Prices
Stearns, No. 2.....per doz. $30 00

BRACES.

Fray's Genuine Spofford's..20&10%
" No. 08.....$7 50
" No. 010..... 8 00

BRACKETS.

Hay Rack.
Wenzelmann's No. 1, per doz. sets.....$18 00
Wenzelmann's No. 2, per doz. sets..... 19 20

Shelf.
Wrought Steel.....40%

Well.
Oak, Wrought Iron Riveted Top Ears.....per doz. $8 00

BURRS, RIVETING.

Copper Burrs only.....25% above list
Tinners' Iron Burrs only.....30%

BUTTS.

Cast Iron.....7½%
Wrought Brass (New List).....Plus 5%
Wrought Steel, Bright.....40%
Wrought Steel, Japanned....Net prices

CALIPERS.

Double.....Nets
Inside and Outside..... "
Wing..... "

CALKS.

Logger's Boot.
(Lufkin R. Co.'s), per M.....$7 00

Toe.
Blunt and medium, 1 prong, per 100 lbs.....$6 20
Sharp, 1 prong, per 100 lbs.... 6 70

CANS.

Milk.
Elgin.

Gals.	5	8	10
Each	$4 00	$5 15	$5 15

Iowa Pattern.

Gals.	5	8	10
Each	$4 00	$5 15	$5 15

CAN OPENERS.

See Openers.

CAPS, GUN.

See Ammunition.

CARPET STRETCHERS.

See Stretchers.

CARRIERS.

Hay.
Diamond, Regular....each, Nets
Diamond, Sling..... " "

CARTRIDGES.

See Ammunition.

CASTERS.

Standard—Ball Bearing.....50&10%
Bed.....40%
Common Plate.
Brass Wheel.....15%
Iron and porcelain wheels, new list.....50%
Philadelphia Plate, new list....50%
Martin's.....40%

CATCHERS, GRASS.

No. 160S, per doz $12 25
No. 165S, " 14 01

CEMENT, FURNACE.

American Seal, 5 lb. cans, net $0 45
" " 10 lb. cans, " 90
" " 25 lb. cans, " 1 87
Pecora, 5 lb. cans..... " 45
" 10 lb. cans ..... " 90
" 25 lb. cans..... " 1 87

CHAIN AND CHAINS.

Breast Chains.
Doubleslack.....doz. pairs, $8 50
With Covert Snaps " 5 80
With Slide..... " 5 00
Without Slide.... " 4 60

Picture Chains.
Light Brass, 3 ft.....per doz. $1 25
Heavy Brass, 3 ft.... " 1 75

Sash Chain. (*Morton's*)
Steel, per 100 ft.
0..... $2 50
2..... 3 10
1..... 3 60

Champion Metal.
0R..... 5 40
2R..... 5 60
1R..... 7 75

Champion Metal.–Extra Heavy.
1H..... 9 50

Cable Sash Chains.
Steel.....List Net Plus 15%

CHALK, CARPENTERS'

Blue.....per gro., $1 40
Red..... " 1 40
White..... " 1 25
Common White School Crayon..... " 25c

CHARCOAL.

In bags.....per bag $1.70

CHECKS, DOOR.

Corbin.....Net list
Russwin.....20%

CHIMNEY OPS.

Iwan's Volcano.....35%

CHISELS.

Box.

Inches	12	14
Round, per doz	$5 25	5 75
Flat, per doz	7 25	8 25

Cold.
Good quality, ¾ in. and larger.....Nets
Smaller size, per doz.....Nets
Socket, Firmer.
Ohio.....Price on Application
Socket, Framing.
Ohio..... Price on Application
Tanged, Firmer.—Barton's.
With handles.....Net list
Choppers, See *Cutters, Meat.*

CHUCKS, DRILL.

Goodell's, for Goodell's Screw Drivers..... List less 35-40%
Yankee, for Yankee Screw Drivers..... 6 00

CHURNS.

Anti-Bent Wood,

Gal	5	7	10
Each	$3 90	4 60	4 85

Belle, Barrel.....65&7½%
Common Dash,

Gal	5	7
Per doz	17 00	19 00

CLAMPS.

Adjustable.
Martin's.....30%
No. 63, Screw.....20%
Cabinet.
Screw.....20%
Carpenters'.
Steel Bar.....List price plus 25%
Carriage Makers'.
2½".....per doz. $7 00
5" ..... " 14 00
8" ..... " 28 00
12" ..... " 46 00
Quilt Frame.
No. 30 Ball and Socket, 2¼" head.....per gross $11 25
No. 50, Ball and Socket, 3¼" head..... per gross 12 25
Hose.
Sherman's, brass, ¾-in., per doz. .48c
Double, brass, ¾-in., " 1 20

Saw Filers.
Wentworth's, No. 1, $12.50; No. 2, $18.25. No. 3, $16.25.

CLAWS, TACK.

Wood hdl. No. 10.....per doz. $0 95
Forged steel, wood hdle. " $1 75
Solid steel..... 2 40
Giant..... 50

CLEANERS.

Drain.
Iwan's Adjustable.....25%
Iwan's Stationary 30%
Pot.
Wire.....per doz. $0 75
Side-Walk.
Steel.....per doz., Net prices

CLEAVERS.

Family.

Beatty's, inch	7	8	9	10
Per doz.	$27 00	29 00	33 00	36 00

CLEVISES.

Malleable .....10c lb.

CLIPPERS.

Bolt..... $2 25&6 00

CLIPS.

Axle.....65&5%
Damper.
Standard.....per doz. 70c
Troy ..... " 38c
Hame ..... " 50c

CLOTH.

Emery.
Star .....New Prices
B. & A..... " "
Hardware Wire— Prices on application
Full rolls (100 ft.)
12 Mesh, galvanized.... "
14 " " .... "
16 " " .... "
18 " " .... "
Screen Wire. Prices on application.
12 mesh, painted, per 100 sq. ft.... ....

COLLARS, STOVE PIPE.

Lacquered.

Inches	5	6	7
Fancy pattern, per doz	80c	85c	$1 15

COMPASSES.

Carpenters'.....15%

COPPER—See Metals.

COPPERS—Soldering.

Pointed Roofing
3 lb. and heavier.....per lb. 37c
2½ lb..... " 38c
2 lb..... " 37c
1½ lb..... " 40c
1 lb..... " 43c

CORD.

Picture.
White Wire.....60&5%
Sash.
Sampson Spot, No. 7. per doz. $24 50
Sampson Spot, No. 7. per doz. $29 40

CORKSCREWS.

Walker's.....30%
Williamson's Regular.....35&11%
Williamson's Forged Worm.....40%

COTTERS, SPRING.

All sizes.....87½%

COUPLINGS, HOSE.

Brass.....per doz. $2 25

COVERS, WAGON—See Tents.

CRADLES, GRAIN.

Morgan's Grapevine ..per doz. $45 00

CRAYONS—See Chalk.

CUTTERS

Glass.
Woodward....40%

Meat.
Enterprise—Nos. 5 10 12
Each $2 50 $4 25 $3 75
Nos. 22 32
" 6 50 8 50

Pipe.
Saunders', No. 1 2 3
Each....$1 85 2 75 6 75

Slaw and Kraut. Per doz.
4-knife Kraut....$20 00-55 00
3-knife Kraut, 8x27 in.. 13 00-18 00
1-knife Slaw.... 2 50
2-knife Slaw.... 3 00
Washer.... 11 00

DAMPERS, STOVE PIPE.

Ideal
3"....$1 00
4"....1 05
5"....1 15
6"....1 25
7"....2 20
8"....3 75
10"....6 00

DIES AND STOCKS.

Discount....New List

DIGGERS.

Post Hole.
Eureka....per doz. $14 50
Iwan's Split Handle (Eureka)
4-ft. Handle....per doz.. 15 00
7-ft. " " " 20 00
Iwan's Perfection (Atlas) " 16 50
Iwan's Hercules pattern " 18 00
See also Augers—Post Hole.
Dividers, Wing....25%

DOOR CHECKS—See Checks.

DOORS, SCREEN.

1/8-in. 4-panel, painted....Net Prices
1 1/8-in. 4-panel, painted.... "
1 1/8-in. 3-panel, natural pine, fancy.... "

DOOR HANGERS—See Hangers.

DRILLS.

Blacksmiths' Twist. (New List)....40%

Breast.
Millers Falls No. 12....Each, $46 00
" " " 112.... " 26 00

Hand.
Goodell's Automatic.
Nos. 01 03
Per doz. 12 00 14 40
Goodell's Single Gear, per doz. 15 75
Goodell-Pratt No. 4 1/2 per doz. list, less....30%
Goodell-Pratt No. 379 per doz. list, less....30%
Reciprocating.
Goodell's....per doz 26 00

DRIVERS, SCREW.

Standard.... Nets
Lock Ferrule.... "
Champion.... "
Champion Pattern.... "
Clark's Interchangeable.... "
Edison.... "
Reed's Lightning.... "
Goodell's Spiral.... "
Yankee Ratchet.... "
" Spiral.... "

EAVES, TROUGH.

55-7 1/2% off Standard List.

ELBOWS—Stove Pipe.

1-piece Corrugated, Uniform.

	Doz.
5-inch	$1 85
6-inch	1 90
7-inch	2 20

Uniform, Collar Adjustable

	Doz.
5-inch	$2 40
6-inch	2 45
7-inch	2 75

ELBOWS—Conductor Pipe.

Galvanized Steel, Tin and Terne, Round Corrugated.

Size.	Doz.
2-inch	60%
3-inch	60%
4-inch	60%
5-inch	60%
6-inch	60%

EMERY, TURKISH.

Size	1-lb.	5-lb.	10-lb.
Per pound	18c	14c	13c

EYES.

Bright Wire Screw—See Ooods, B. W.
Drifting Pick....60, 10&5%
Hooks and Eyes—
Brass, 1 1/2" No. 60..per gross, $3 50
Iron " " 50.. " 1 60

FASTENERS, STORM SASH.

Shroeder's....per doz. $1 50
Sensible.... " 3 00

FILES AND RASPS.

Delta
Delta....30%
Swiss....List plus 25%
Utility.... " net.

Nicholson's—
American....60%
Arcade....50-10-7 1/2%
Black Diamond....50&5%
Eagle....50-10-7 1/2%
Great Western....50-10-7 1/2%
Kearney & Foot....50-10-7 1/2%
McClellan....50-10-7 1/2%
Nicholson brand....50&7 1/2%
J. Barton Smith....50&2 1/2%
X-F Swiss Pattern....Net list.

Simonds'....50%
Disston's....50&10%
Heller's....60&10%

FORKS.

Barley.
Steel, new list....New Prices
Hay.
2-tine....New prices
3- "....New prices
4- "....New prices
Digging....New prices
Scoop....New prices
Header.
3-tine....New prices
4- "....New prices
Manure
4-tine....New prices

FREEZERS—ICE CREAM.

White Mountain 1-quart....@
" " 2 "....@
" " 4 "....@
" " 6 "....@
Arctic....1 "....@
" ....2 "....@
" ....4 "....@
" ....6 "....@
Prices on application

GAUGES.

Cream Pail.
Fairmount....per doz. $3 75
Marking, Mortise, etc....
....Nets
Wire.
Disston's....25%

GIMLETS.

Discount....35@40%

GLUE.

Bulk.
B Amber....per lb. 35c
A White.... " 40c
H. S. Amber.... " 32c
Liquid.
Army & Navy....40%
Le Page's—
List "A"....37 1/2%
List "B"....33 1/3%
List "C"....25 %

GREASE, AXLE.

Wood Boxes.
Frazer's....per gro. $13 00
Hub Lightning....7 50
Wood Pails.
Frazer's, 15lb.$1.00; 25 lb.$1.50 each
Hub Lightning, 15 lb. 90c; 25 lb. $1.21 each.
Tin Cans.
Frazer's
1 1/2lb. per doz....$1 75
3 lb. per doz.... 3 25

GRINDSTONES.

Family.

Inches..	7	8	10	12
Per doz..	20 50	21 75	26 25	30 50

Loose.
Per ton.... Price on application
Mounted.

Ball Bearing....	1	2	3
Each....	$4 75	5 00	5 25

GUN WADS.

(See Ammunition).

GUNS.

Iver Johnson Champion Single Barrel Shot Guns....Net Prices
Double Barrel, Hammerless. "

HAFTS, AWL.

Brad.
Common....per doz. $0 35
Peg.
Patent, plain top.... " 80
Patent, leather top... " 90
Sewing.
Common.... " 24
Patent.... " 55

HAMMERS, HANDLED.

	per doz., net
Blacksmiths, Hand, No. 0, 26 oz.	$11 11
Engineers', No. 1, 26 oz....	11 11
Farriers', No. 6, 7 oz....	7 23
Machinists', No. 1, 7 oz....	6 65

Nail.
Vanadium, No. 41 1/2, 16 oz., per doz....$17 50
V. B., No. 11 1/2, 16 oz. per doz. 13 95
Garden City, No. 111 1/2, 16 oz., per doz.... 11 90
Tinner's Riveting, No. 1, 8 oz., per doz.... 9 40
Shoe, Steel, No. 1, 13 oz. per doz. 10 00
Tack.
Magnetic.
Per doz.... $5 63

HAMMERS, HEAVY.

Heavy Hammers and Sledges.
Under 5 lbs....50%
5 lbs. and over....50&10%
Masons'.
Single and Double Face....50%

HANDLES.

Auger.
Common Assorted....per doz. $0 75
Pratt's Adjustable, Nos. 1 & 2, per doz.... 6 00
Ives' Adjustable....per set, 1 35
Axe....30%
Chisel.
Hickory, Tanged, Firmer, Assorted, 55c; Large, 85c per doz.
Hickory, Socket Firmer, Assorted, 70c; Large size, 80c per doz.
Coal Pick....40%
Drifting Pick....40%
File, assorted, 30c; Large, 35c per doz
Hammer.
Adze Eye....per doz. 40 to $1 00
Blacksmiths'.... " 45c@1 00
Machinists'.... " 50c@1 00
Hay and Manure Fork....25%
Screw Driver.
Assorted.... " 60
Large.... " 90
Shovel and Spade....25%

HANGERS.

Barn Door.
U. S. Rolled Bearing....12 1/2%
Matchless....12 1/2%
Warehouse Tandem, No. 44....33 1/3%
Conductor P.
Iwan's Perfection....45%
Eave Trough.
All sizes. 5" or smaller, ...per gross. $3 80 Net
All sizes, larger than 5", ...per gross. 5 00 "
Garage Door.
Right Angle....50&10%
Sliding Folding....50%
Receding....50%
Parlor Door.
Acme....per set, $3 75
Ives' Improved.... " 3 40
Lane's Standard.... " 3 50
Lane's New Model... " 3 10
Le Roy Noiseless....40&10%
Richards....25%
Advance....40&10%

HASPS.

Hinge, Wrought.... Add 50% to list.
With Staples—See Staples.

HATCHETS.

Crescent....50%
Cast Claw....per doz. $1 50@1 85
Cast Shingling... " 1 50@1 85
Germantown....7 1/2%

HAY KNIVES.

See Knives.

HAY RACK BRACKETS

Wenzleman's No.1 per doz. sets, $18 00
Wenzleman's No. 2 " " 19 20

HINGES.

Blind.
Clark's Gravity

No. 1....per doz. sets,	$2 25		
No. 3.... " " "	5 75		
Gate.			
Clark's....	1	2	3
Hgs & Ltch, doz.	$5 50	7 00	9 75
Hinges only "	4 75	5 50	8 00
Latches only.	1 90	1 90	....

Screen Door.
Cast Iron....gross $10 00
Steel.... " 7 00

Spring.
Chicago....Add 12 1/2% to list.
Columbia Dbl. Acting...40&10&5%
Gem....25%
Ideal Detachable...per gro. $11 00
Matchless....40%
New Idea....per gro. $7 20
Oxford....20%

Wrought Iron.
New Lists....
Light Strap Hinges....5&5%
Heavy Strap Hinges....20&7 1/2%
Light T Hinges....List plus 5%
Heavy T Hinges....List plus 45%
Extra Heavy T Hinges....15&5%

Screw Hook and Strap.
6 to 12 in....per 100 lbs. $7 75
14 to 20 in.... " " 7 50
22 to 36 in.... " " 7 25

Screw Hook and Eye.
1 in....per doz. pair $2 60
3/4 in.... " " 3 50
1/2 in.... " " 5 00

HOES.

Garden....Net
Grub.
Extra....New prices
Hazel....per doz. New prices
Ladies' and Boys'....New prices
Mortar....New prices
Planter's Eye....New prices
Weed....New prices

HOOKS.

Awning. No. 60....per gro 50%
Belt.
Brown's....70&5%
Jones'....65&5%
Bench.
See Stops, Bench.

Box.
Inch..... 5 7 10 12
Per doz...$2 50 2 75 3 25 3 85

Bush.
Common Axe Handle, per doz.$22 00

Chain.
Inch.. ¼&⅜ ½ ⅝ ¾
Pr 100 $7 60–8 10 9 75 11 50 12 60

Clothes Line.
Japanned.....per doz.48c @1 40
Galvanized..... " 75c@2 50

Coat and Hat.
Common Wire....per gro. 1 25-1 65

Conductor.
Iwan's Tinned Sickle..... List.

Corn.
Common, riveted, painted
red.....per doz. Nets
Little Giant..... " "

Gate.
See Goods, Bright Wire.

Grass.
Common Nos. 1 3 5 7
Per doz...$4 50 3 50 3 75 3 25

Hammock.
With plate.....per doz. 1 10
With screw..... " 1 00

Lambrequin, or Drapery, per gro...30c
Picture.....50%@50&10%
Potato and Manure.....Nets
Screw.
Brass.....70%

(See Goods, Bright Wire.)
Seat Spring.....per lb. 5½c

HOSE, GARDEN.

Per ft.
Guaranteed 3 ply ½ inch .....16 c
" 4 ply ½ inch 18½c
" 5 ply ½ inch 13½c

COTTON COV. RUBBER HOSE.

High Grade Apache 1" guar. press.
400 lbs.....40c

HUSKERS.

Boss.
Nos..... B E
Per doz.....New Nets
No. 59.....per doz. New Nets

IRON, PIG.

See Metals.—First column.

IRONS.

Curling.
C.....per doz. $4 40
B..... " 50
A..... " 58
Princess..... " 1 25
Thelma..... " 1 25
Pinking..... " 1 00

Plane.
Wood Bench.....Add 10% to list

Sad.
Charcoal.....per doz. $11 00
Common, polished, per 100 lbs. 7 75
No. 70 Asbestos.....$1 50 net
No. 100 " ..... 1 75 net
Common, nickel plated..... 8 25
Mrs. Pott's,
No. 50 J, Enterprise, per set, Nets
No. 55 J, " " "
No. 50 T, " " "
No. 55 T, " " "
Tailors' Sad.....per lb "
Tailors' Goose..... " "

Ideal.
6 lb. Household.....$3 50
9 lb. Dressmakers'..... 4 25
14 lb. Tailors' Goose..... 5 50

Tuyere.
Single Duck Nest....per doz. $5 25
Double Duck Nest .. " 6 25
Sutton..... ....each 2 60

JACKS.

Locomotive.....30%

Wagon.
Richard's No. 1.....per doz. $15 50
Miller..... 20 00
Oliver,
Nos..... 0 00
Each.....$0 60 $0 80
Standard,
Nos..... 1 2
Each.....$0 60 1 00
R-W
Pig Lift.....40%
Tiger.....40%

KETTLES.

Brass.....15%
Cauldron.....40&5%
Copper.....per lb. 27
Maslin.....40&10%
Sugar.....50%

KNIVES.

Beet Topping.
Clyde, 9-in. Scimiter Blade, dz. $3 85
California..... 3 40
Butcher. Per doz.
Beechwood Handles, 6" blade..$4 00
" " 7" " ..4 65
" " 8" " .. 5 65
Cooper's Hoop.....15%

Corn.
Clipper.....per doz. $1 75
Disston's..... " 2 75
Earle's..... " 3 00
Woodford..... " 2 25

Drawing.
Standard .....List&5%
Adjustable.....15%
Barton's Carpenters'.....15%

Hay.
Iwan's Solid Socket.....doz.$13 00
Heath's..... " 13 00
Iwan's, Sickle Edge..... " 18 00
Iwan's, Impv'd Serrated. " 18 00

Hedge.
Challenge.....per doz. $6 00
Disston's..... " 3 75

Mincing.
Common, Single..... " 60
Common, Double..... " 90
Streeter, 4-blade..... " 1 30
Streeter, 6-blade..... " 2 00

Putty.
Common.....per doz. $0 75@1 50
Lander's..... " 1 75@2 50

Scraping.
Beech Handle..... 90@1 10
Lander's..... 5 50@6 50

KNOBS.

Doors.
Mineral.....per doz. $1 80
Porcelain..... " 1 90
Jet..... " 2 00

LADDERS.

Common Long.
Per ft.....17c@23c
Extension.
Per ft..... 22 to 28
Step.
Common, per ft.....23c
Common, with Shelf, add 10c.
IXL.....34c
Challenge, 6 to 9 ft.....55c
10 to 16 ft.....60c

LANTERNS.

Bull's Eye Police.
3 in. Flash Light...per doz. $13 00

LEADERS, CATTLE.

Nos..... 51 52
Per doz.....$1 35 1 45

LEATHER, LACE.

Rawhide ⅛".....100 ft. $2 60
" ¼"..... " 4 40

LEATHERS, PUMP.

Valve and Plunger.....10%

LIFTERS.

Stove Cover.
Coppered.....per gro. $3 25@5 50
Alaska..... " 8 00
Alaska..... " 10 00
Transom.
Payson's.....55%

LINES.

Chalk.
Twisted in 20-ft. hanks.
Nos. 4 6 7 8 9
Gro.....Prices on Application
Twisted in 50-ft. balls.
Nos..... 1 2 3 4
Per doz.....Prices on Application
Braided in 20-ft. hanks.
Nos..... 0 1 2 3
Per doz.....Prices on Application
Mason's..... " " "
Clothes.
60 ft. Jute.....per doz. $0 95
60 ft. Sisal..... " 40
50-ft. Cotton..... " 15
50-ft. Braided Cotton..... " 25

LINING, STOVE.

Bricks.....per crate, 42c

LOCKS.

Barn Door.
No. 60 Stearns.....per doz. $10 00
No. 80 " ..... " 17 50

MACHINES.

Riveting.
Stearns No. 1.....per doz. $12 00
Tenoning.
No. 50 Peace's Spoke...each $11 50

MAIL BOXES.

See Boxes.

MALLETS.

Carpenters'.
Fibre Head, No. 2, per doz. $16 50
" No. 3 " 19 50
" No. 4 " 28 50
Round Hickory..... " $3 00– 5 00
" Lignumvitæ.. " 6 25–10 50
Square Hickory..... " 3 50–5 50
" Lignumvitæ.. " 8 00–12 00
Tinners'.
Hickory..... " 2 25

MATS.

Door.
National Rigid.....50&10&5%
Acme Steel Flexible.....50%

Stove.
No. 2.....per gro. Nets
No. 1..... " "
No. 1 Asbestos Toasters, or
wire-covered Stove Mats,
with handle.....per doz. 1 10
No. 2 Asbestos Toasters, with
ring..... per doz .. 60

MATTOCKS.

Plumbs.....25%

MAULS.

Iron, lbs 10 13 16 18
Per doz.....Prices on Application
Wood Face, lbs..... 10 12 14
Per doz.....Prices on Application
Wood Choppers'.
Lake Super'r & Oregon Pat. 40&5%

MEASURES.

Galvanized, doz.....Nets
Japanned, doz.....Nets

MILLS, COFFEE.

Enterprise.....16⅔%
Parker.....50&5%
Arcade.....40-10%

MITRE BOXES.

See Boxes.

MOPS

Cotton. Star (Cut Ends).
Pounds 12' 15' 18' 24'-3 oz.
Per doz. $4 50 5 65 6 75 9 00

MOWERS, LAWN.

Gladiator—B. B.
Inches..... 16 18 20
Each.....$6 50 7 25 8 00
King Universal—B. B.
Each.....$5 25 5 75 6 00
Inches..... 14 16 18
Big Giant.....$3 50 3 90 4 25

NAILS.

Cut Steel.....Prices on Application
Cut Iron..... " " "
Wire.
Small Lots ...Prices on Application
Cement Coated.
Small Lots....Prices on Application
Horseshoe.
Ausable..... 55&5%
Capewell.....15%
Perfect.....55&5%
Putnam.....20&5%
Star.....30&5%
Picture.
Brass Heads 25%
Brads.....50&
Furniture.....List plus

NAIL PULLERS.

See Pullers.

NAIL SETS.

See Sets.

NETTING, POULTRY.

Galvanized before weaving.....50%
Galvanized after weaving.....45%

NIPPERS.

End Cutting.
Stubb's Pattern, Inches. 5 6
Per dozen.....$4 65 6 75
End and Diagonal Cutting.
Swedish Side. Inches.. 5 6
Per dozen.....$4 50 5 75
Hoof.
Heller's.....40&10%
V. & B.....55&5%

NOZZLES.

Hose.
Magic.....per doz. $9 50
Diamond..... " 5 75

NUTS, HOT PRESSED

Square Tapped.
$1.85 off per 100 lbs.
Hexagon Tapped.
$1.85 off per 100 lbs.

OILERS

Chase Pattern.
Brass and Copper.....10%
Zinc.....33⅓%
Engineers'.
Tin.....per doz. $7 00@ 9 00
Machine.
Common.....per doz. $0 85

OPENERS.

Box.
See Box Chisels
Can.
Delmonico.....per doz. $1 30
Never Slip..... " 65
Crate.
V. & B..... " 7 25-11 00

OUTFITS, COBBLING

Combination.....per doz.$16 00
Economy..... " 8 50
Family..... " 14 50

PAILS.

Cream.
14-qt., without gauge,per doz. $9 50
18-qt., " " " 11 00
20-qt., " " " 11 75
Sap.
10-qt., IC Tin.....per doz. $4 00
12 " " " ..... " 5 50
Stock
Galv'd. qts. 14 16 18 20
Per doz...$9 75 10 75 12 75 14 50
Water.
Galvanized, qts.. 10 12 14
Per doz.....$5 75 6 50 7 25
Wood.
Cable, 2-Hoop.....per doz. Nets
Cable, 3-Hoop..... " Nets
Cedar, 3-Hoop,brass.. " Nets

PANS.

Dripping.....Net

Fry.
Common.....Nets
Acme..... "

Roasting.
Paxton,
Nos.... 1 2 3 4
Per doz.....Nets
Neverburn..... "
Savory No. 200.....per doz. $8 40

PAPER.

Building
Plain.....per 100 lbs. Prices on Application
Tarred..... "
Tarred Felt..... "
Red Rosin, per ton.....$75 00
Sand and Emery.
No. 1, per ream, best grade.... $5 40
No. 1, per ream, cheaper grade. 4 85
Wrapping.
Express.....100 lbs. Nets

PARERS

Apple.

Goodell's	per doz.	$10 80
Turntable	"	11 40
White Mountain	"	8 40
Reading, No. 78	"	11 40

Potato.

Goodsell's Saratoga, 10½ in.,	dz.	6 50
Goodsell's Saratoga, 5 in.,	dz.	5 50

PICKS.

Adze Eye Ore	22½%
Drifting and Poll Picks	22½%
Plumbs, Railroad	22½%
Surface	22½%

PINCERS.

Carpenters', cast steel.

Inches	6	8	10	12
Per doz.	$3 75	4 75	6 25	7 00

Blacksmiths'	45%
Heller's	40%

PINS.

Clothes.

Common	per box of 5 gro.	$0 95

Picket

Fluted, 15-in	per doz.	$1 10
Fluted, 21-in	"	1 60
Spiral	"	1 90

PIPE.

Conductor.

Plain Round and Round Corrugated

29 Gauge	65%
28 "	55%
26 "	45%
24 "	20%

Square Corrugated A and B and Octagon.

29 Gauge	50%
28 "	45%
26 "	35%
24 "	15%

Galvanized Toncan Metal, Genuine O. H. Iron, Lyonore Metal, Charcoal Iron and Keystone C. B.

Plain Round and Round Corrugated

28 Gauge	50%
26 "	40%
24 "	15%

Square Corrugated A and B Polygon and Octagon.

28 Gauge	45%
26 "	35%
24 "	15%

14 and 16 oz. Copper, all designs . . 20%

Portico Elbows.

Galvanized and Terne Steel.

1 -inch	45%
1½-inch	45%
1½-inch	45%
2 -inch	45%
Tubing	40%

Discounts on Round apply on sizes 2 inch to 6 inch inclusive.

Freight allowed on 15 dozen or more Less than 15 dozen F. O. B. Factory

Terms: 30 days net, 2% ten days.

Standard Gauge Conductor Pipe, plain or corrugated.

Not Nested	45%
Nested solid	45-5%

Stove.

	Per 100 Joints
29-Gauge, 3-inch	$16 00
" 4-inch	16 50
" 5-inch	17 25
" 6-inch	18 00
" 7-inch	20 00

T-Joint Made-up.

6-inch	per 100	$50 00

Furnace Pipe.

Double Wall Pipe and Pittings	20%
Single Wall Pipe, Round Pipe Fittings	15%
Galvan'd and Black Iron Pipe, Shoes, etc	15%

PLANES.

Stanley Iron Bench . . . . . net

PLATES, TIN

See Metals in Column 1.

PLIERS.

Giant, Button's—Nets

Cutting.

Bernard's	New Prices
Lodi	New Prices
Paragon	New Prices

Fencing.

Black Bull	All Nets
Farmers' Choice	All Nets
Russell's	All Nets

Flat and Round Nose.

Bernard's	New Prices
Lodi	New Prices
Paragon	New Prices

Tinners'.

Hollow	Net list
Solid	each, 10c

PLUMBS AND LEVELS.

Common	Nets
Cook's	40%
Davis' Iron	25%
Davis' Inclinometer	15%

POINTERS, SPOKE.

Stearns' No. 1	per doz.	$ 8 00
" No. 2	"	10 00

POKERS, STOVE.

Wr't Steel, str't or bent	per doz.	$0 75
Nickel Plated, coil hanl's	"	1 10

POLISH.

Metal.

Wizard, 6 oz.	per gross		$18 00
" ½ pt.	"	"	20 40
" 1 pt.	"	"	36 00
" 1 qt.	"	doz.	6 00
" ½ gal.	"	"	10 80
" 1 gal.	"	"	18 60

Stove. Per gross

Black Eagle Paste 5 oz.	$13 80
" " " ½ lb.	17 40
" " " 1 lb.	31 20
" " " 5 lbs. per case	5 25
Black Eagle Liquid, 6 oz. per gross	15 60
Black Kid Paste, 5 lbs. per case	6 00
Black Jack Liquid ½ pt. per gross	15 60
Black Jack Paste #10 per gross	13 20

FIRE POTS.

Clayton & Lambert's, each	$4 00@6 00
Gate City	each, 6 25
Gem	each, $6 75@8 50

POWDER.

See Ammunition.

PRESSES, FRUIT AND JELLY.

Enterprise Manufacturing Co. . . . 25%

PRIMERS.

See Amunition.

PRUNERS.

Disston's Pole	per doz.	$18 00
Water's Improved		60%

PULLERS.

Cork.

Daisy	each,	$3 10
Phœnix	"	1 40
Quick and Easy	"	2 70

Vail.

Giant	per doz.	14 50
Never-Slip	"	17 00

PULLEYS.

Awning—Jap'd	10%
Clothes Line	10%

Hay Fork.

Iron Wheel, 5-in.	per doz.	2 50
Wood Wheel, 6-in.	"	2 65
Wood Wheel, 6-in., pass knot	per doz.	3 00

Sash.

Common	Net
Common-Sense, 2-in.	Net
Empire Pattern, 2-in.	Net
Ideal	Net
Steel	Net

PUMPS.

Pitcher Spout.

Nos.	1	2	3	4
Each				Nets

Spray.

Midget Junior	per doz.	3 75
New Misty	"	6 00
Crescent	"	6 50

PUNCHES.

Conductors.

No. 22	per doz.	$3 00
Machine	per lb.	25

Saddlers'.

Common	per doz.	1 50 to 5 00

Revolving Spring.

Stearns, No. 10	per doz.	$ 6 25
" No. 40	"	12 00
" No. 60	"	16 00

PUTTY.

Strictly pure	per 100 lbs.	$4 25

RAIL.

Barn Door.

Matchless, 1-in	5c
Matchless, 1½-in	7c
Storm King	5c

Sliding Door.

Bronzed wrought iron	per ft. 8½c

RAKES.

	Per doz.
Garden.	
Steel, Bow, 12-inch Teeth	$8 50
Steel, Bow, 14-inch "	9 25
Malleable Iron, 12-in. "	4 75
Malleable Iron, 14-in. "	5 00

Hay.

Wood, 10 Teeth	$4 00

Lawn.

20 Teeth	per doz.	$5 50

RASPS—See Files.

RAZORS—SAFETY.

Gillette	per doz.	$45 00
Auto Strop	"	45 00
Gem	"	8 40
Gem (3 doz. lots)	"	8 00
Ever Ready	"	8 40
Ever Ready (3 doz. lots)	"	8 00

RAZOR STROPS.

Star (Honing)	50%

REGISTERS.

Cast Iron	10%
Steel and Semi-Steel	20%
Solid Brass or Bronze Metal prices on application	
Baseboard	20%
Adjustable Ceiling Ventilators	20%

REGISTER FACES.

Japanned, Bronzed and Plated.

4x6 to 14x14	20%
14x14 to 38x42	40%

REVOLVERS.

Iver Johnson Safety Automatic Hammer	New Nets
Hammerless	"
I. J. Model 1900	"

RINGS AND RINGERS.

Bull.

Copper	2½-in.	3-in.
Per doz.	$2 40	$2 65
Rea's Improved Self-Piercing copper, doz.	3 40	
Steel, per doz.	1 50	1 80

Hog.

Blair's Rings	per doz.	$ 75
Blair's Ringers	"	1 00
Brown's Rings	"	72
Brown's Ringers	"	1 00
Hill's Ringers	"	1 00
Hill's King, boxes	"	72
Major Rings	"	60
Perfect Ringers	"	1 50
Wolverine Rings	"	1 65
Wolverine Ringers	"	1 10

Fruit Jar.

White	per lb.	30c

Key.

Split, round	per doz.	$0 17
Split, square	"	32
Ball, round	"	40

RIVETS.

Copper Belt	Add 15% to list
Coppered Iron	30%
Tinners'	30%
Hame	per lb. $0 17
Slotted Clinch	per doz. 60c@1 10

Tubular.

Nos. 1 and 2 assorted sizes, 50 in box	doz. 75c
Nos. 1 and 2 assorted sizes, 10 in box	doz. 1 40

RIVET SETS.

See Sets.

ROPE.

Cotton.

¼, 5-16 in. Com. on reels, per lb.	85c
¼, 5-16 in. Com. in coils. "	85c

Sisal

1st Quality	19½c
No. 2	17½c

Pure Manila.

1st Quality, base	per lb.	28½c
Hardware Grade	per lb.	27½c

RULES.

Prices on application

Lufkin's Hickory Board	"
Lufkin's Log	"
Lufkin's Boxwood	"
Lufkin's Zigzag	"

SAWS.

Band.

E. C. Atkins & Co.	Prices on applic'n
Disston's	Prices on applic'n

Buck.

Disston's	Prices on applic'n
Jackson's	New nets

Butchers'.

E. C. Atkins & Co.	Prices on applic'n
Disston's	Prices on applic'n

Circular.

E. C. Atkins & Co.	Prices on applic'n
Disston's	Prices on applic'n
Hiles'	New nets

Compass.

E. C. Atkins & Co.	Prices on applic'n
Disston's	Prices on applic'n

Coping.

E. C. Atkins & Co.	Prices on applic'n
Disston's	Prices on applic'n

Cross-Cut.

E. C. Atkins & Co.	Prices on applic'n
Disston's	Prices on applic'n

Dehorning.

Disston's	Prices on applic'n

Flooring.

E. C. Atkins & Co.	Prices on applic'n
Disston's	Prices on applic'n

Hack.

Disston's	Prices on applic'n

Hand and Rip.

E. C. Atkins & Co.	Prices on applic'n
Disston's No. 7	Prices on applic'n
Disston's Nos. 8, D8, 12, 76, 112, D100, and 120.	Prices on applic'n
Keystone	New nets

Keyhole.

E. C. Atkins & Co.	Prices on applic'n
Disston's	Prices on applic'n

Miter Box.

E. C. Atkins & Co.	Prices on applic'n
Disston's	Prices on applic'n

Panel.

E. C. Atkins & Co.	Prices on applic'n
Disston's No. 7	Prices on applic'n

Patternmakers'.

E. C. Atkins & Co.	Prices on applic'n
Disston's	Prices on applic'n

Pruning.

Disston's	Prices on applic'n

Stairbuilders'.

E. C. Atkins & Co.	Prices on applic'n
Disston's	Prices on applic'n

Wood.

E. C. Atkins & Co.	Prices on applic'n
Disston's	Prices on applic'n

SAW BUCKS—See Bucks.

SAW SETS—See Sets

SAW TOOLS—See Tools.

SAW FRAMES.

Common, plain	per doz.	$1 50
Common painted	"	2 10

SCALES.

Counter.

Pelouze	40&10%

SCISSORS.

Star	60%

SCOOPS.

Grain.

½ bu. "Hercules"	per doz.	3 70
1-bu. "Hercules"	"	5 00

SCRAPERS.

Box.

Triangular, No. 6	per doz.	$6 25

Road.

Cubic ft.	7	5	3
With runners, ea.	$7 00	6 50	6 20

SCREEN DOOR HINGES.

Cast iron	gross,	$13 00
Steel	"	9 50

SCREWS.

Bench.

Iron, ins.	1	1½	1	1½
	$6 82	7 87	9 45	16 80

Wood, white maple	per doz.	6 00
Hand—Wood		50%
Hand Rail		22½%
Jack		20%
Lag or Coach—all sizes, gimlet pointed		45-5%

Saw—Centennial,

Nos.	1	2	3	4
Per doz.	47c	55c	75c	90c

Wood.

F. H. Bright	70-10-10%
R. H. Blued	65-10-10%
F. H. Jap'd	62½-10%
F. H. Brass	60&15%
R. H. Brass	57½&15%
R. H. Nickel Plated	57½-10%

SCYTHES.

Clipper, Grass	per doz.	$13 50
Honest Dutchman	"	13 70

SETS.

Nail.
Square head..... per doz. $1 25
Cup point, knurled.. " 1 15

Rivet.
Farmers'.....per doz. $2 10
Tinners'.....25%

Saw.
Aiken's Pattern.....per doz. $6 50
Disston's Monarch... " 7 20
Disston's X-Cut..... " 13 50
Leach's..... " 80
Nash's Hand..... " 3 15
Nash's X-Cut..... " 4 20
Stillman's Lever..... " 1 30
Stillman's X-Cut..... " 2 50
Whiting Pattern, No. 21 " 5 75
Eccentric Anvil, Hand, No. 395, N. P. Morrill Pattern, ...per doz. 11 50

SHARPENERS, SKATE.

Diamond.....per doz. $1 60
Perfect.....1 20

SHEARS.

	Per Doz.
Nickel Plated, Straight, 6"....	$12 90
" " " 7"....	14 85
" " " 8"....	16 30
Japanned, Straight 6"....	11 00
" " 7"....	12 40
" " 8"....	13 80

Tinners'—See Snips.

SHEAVES, SLIDING DOOR.

Common.

Inches....	3	4	5
Per set.....	$1 40	1 75	2 40

Hatfield's.

Per set....	$1 80	2 10	2 75	25

SHELLS—See Ammunition.

SHELLERS, CORN.

Union.....per doz. $6 75

SHIELDS.

Expansion Bolt Shields.....60%

SHOES.

Conductor.....60%

SHOT—See Ammunition.

SHOVELS AND SPADES.

Coal.
No. 2, Woodford.....per doz. $5 50
No. 182..... " 6 00
Ames', new list.....Discount, 12½%

	Per doz.
Neverbreak, hollow bck, blk....	Nets
National... " " ...	"
Buckeye... " " ...	"
Mohawk... " " ...	"

Bar Drain & Ditching
Iwan's Perfection.....$30 00

Railroad, etc.

	Net
Black Diamond.....per doz.	
Crescent..... "	"
Keystone..... "	"
Star..... "	"
Hollow Back..... "	"

Ames', new list.....Discount, 12½%

Snow.
Galvanized, with wood handle, No. 56.....$1 45
No. 55..... 1 55

Alaska Steel.
D-Handle.....per doz. $3 50
Long Handle..... " 3 00

SINKS.

Cast Iron.
Painted, 16x24..... Net
Enameled, White, 16x24..... "

Wrought Steel.
Painted, 16x24..... "

SLEDGES—See Hammers.

SNAPS, HARNESS.

Covered Spring.....Add 30%
Judd's Pattern.....Add 33⅓% to list

SNATHS.

Double Ring, Bush.....per doz. $9 75
Patent Loop, Bush..... " 10 00
Patent Loop, Grass.... " 8 75

SNIPS, TINNERS'.

Clover Leaf.....40&10%
National.....40&10%
Star.....50%

SOLDER—See Metals.

SPRINGS, DOOR.

Perfect.

Nos.....	2	3	4	5	6	7
Per doz..	.55c	60c	65c	75c	90c	1 00

Reliance.

	Light	Medium	Heavy
Per doz..	$1 55	2 10	3 20

Torrey's.....per doz. 1 65

SPRINKLERS, LAWN.

Bearss' No. 1.....per doz. $9 75

SQUARES.

Steel and Iron.....Nets new list
(Add, for bluing, $3.00 per doz., net.)
Mitre.....
Try..... Nets
Try and Bevel.....
Try and Miter.....
Fox's.....per doz. $6 00
Winterbottom's.....10%

SQUEEZERS, LEMON.

Common Wood.....per doz. $0 70
Porcelain Lined, Wood. " 1 25
Boss, malleable iron.... " 1 20
Iron frame, porc'n bowl " 1 90
Iron Frame, glass bowl.. " 2 35
Little Giant, tin'd iron.. " 4 00
Drum, japanned..... " 3 60
Drum, nickel plated.... " 4 50

STAPLES.

Blind.
Barbed.....per lb. 21@22c

Butter Tub..... " 16@19c

Fence—
Polished.....per 100 lbs. $5 45
Galvanized..... " 6 15

Netting.
Galvanized.....per 100 lbs. 6 50

Wrought.
Wrought Staples, Hasps and Staples, Hasps, Hooks and Staples, and Hooks and Staples.....50&10%
Extra heavy.....35%

STEELYARD.

Discount 25%.

STONES.

Axe.

	New Nets
Hindostan.....per lb.	
More Grit..... "	"
Washita..... "	"

Emery.
No. 126.....per doz. New Nets

Oil—Mounted.
Arkansas Hard No. 7 per doz. New Nets
Arkansas Soft..... " "
Washita No. 717... " "

Oil—Unmounted.

	New Nets
Arkansas Hard....per lb.	
Arkansas Soft..... "	"
Lily White..... "	"
Queer Creek..... "	"
Washita..... "	"

Scythe.

	New Nets
Black Diamond....per gro.	
Crescent..... "	"
Green Mountain. "	"
LaMoille..... "	"
Extra Quinnebog. "	"
Red End..... "	"

STOPS, BENCH.

No. 10 Morrill pattern, per doz. $10 00
No. 11 Stearns " " 8 75
No. 15 Smith " " 6 50

STOPPERS, FLUE.

Common.....per doz. $1 10
Gem, flat, No. 3..... " 1 00
Gem, No. 1..... " 1 10

STOVE PIPE—See pipe.

STOVE BOARDS—See Boards.

STOVE POLISH—See Polish.

STRAPS.

Skate.....per doz. 85c & 1 20

STRETCHERS.

Carpet.
Bullard's.....per doz. $3 90
Excelsior..... " 5 25
Malleable Iron..... " 70
Perfection..... " 6 30
King..... " 4 50

Wire.
O. S. Elwood, No. 1...per doz. Nets
O. S. Elwood, No. 2.. " "

SWIVELS.

Malleable Iron.....per lb. $0 10
Wrought Steel.....per gro. 4 50

TACKS.

Bill Posters' 6-oz., 25 lb. boxes, per lb..... 15c
Upholsters' 6-oz., 25-lb. boxes, per lb.....15½c

TAPES, MEASURING.

Asses' Skin..... List&40%
Lufkin's Steel.....Prices on applic'n
Lufkin's Metallic...Prices on applic'n
Lufkin's Pocket.....Prices on applic'n

THERMOMETERS.

Tin Case.....per doz. 80c@$ 1 25
Wood Back... " $2 00@ 12 00
Glass..... " 12 00

TIES.

Bale.
Single Loop, carload lots.....75&7%
" " less than car lots 70&15%

Cow—See "Chains."

TOOLS, SAW.

Disston's Universal.....40%

TRAPS.

Game with Chains.	Per doz.
Victor No. 1.....	$2 01
Oneida Jump No. 1.....	2 75
Newhouse No. 1.....	5 62

Mouse and Rat.	Net per gross
Out O'Sight Mouse.....	$ 8 00
" " Rat.....	15 00
" " Mole.....	100 00
#44 Pocket Gopher.....	20 00
Victor Mouse.....	2 60
Hold Fast Mouse.....	2 60
Victor Rat.....	11 00
Hold Fast Rat.....	11 00
Official Rat.....	13 50
Wood Choker Mouse, 4 Holes	11 00

TROWELS.

Brick.
Clover Leaf.....30%
Brade's.....15&5%
Disston's.....30%
Rose's.....Net

Plasterers'.
Clover Leaf.....40%
Disston's.....25%
W. & McP.....Net

TRUCKS.

Bag.....each, $3 75
Warehouse or store.
No 1, each.....$24 50
" 2, " 22 50

TUBS, WASH.

Standard, Wood,				Ex.
Nos.....	3	2	1	large
Per doz..	$9 50	11 25	12 75	15 50

Galvanized.			
No.....	1	2	3
Per doz.....	13 75	15 95	18 60

TWINE.

	Market Quotation
3-ply Cotton Wrapping.....	
½ " "	
¼ Extra Wrapping.....	
¼ " Hvy. Wrapping..	
¼ " Wrapping on tubes...	
⅓ " — " cones...	
4 " " " ...	
India Hemp, ½-lb. balls, No. 18..	
2-ply Jute, 1-lb. balls.....	

Seins.	Market
Soft.....per lb	Quotation
Med..... "	"
Hard..... "	"
Staging, ½-lb. ball, size 21.....	"
" " " 24.....	"
" " " 27.....	"
Bagging, ½-lb ball.....	"
3-ply, "B" in hanks.....	"
4- " "B" "	"
3- " "A" "	"
3- " Silver Finish, in hanks...	"

Fodder or Lath.
130 strand.....

VISES.

No. 21, Hand..... $5 00
Oval Slide,

Inches	2	2½	3	3½	4½
Each.	$2.40	$2.60	$3.00	$3.75	$7.75

No. 1, Genuine Wentworth, Noiseless Saw.....per doz. 13 50
No. 2, Genuine Wentworth, Noiseless Saw.....per doz. 20 00
No. 3, Genuine Wentworth, Noiseless Saw.....per doz. 18 00
No. 500, All Steel Folding Saw .....per doz. 13 50

WARE.

Glue Pots.
Tinned.....Add 15% to list
Enameled.....30%

WASH BOARDS—See Boards.

WASHERS.

Standard O. G. cast iron...per lb. 3½c
Wrought steel in 5-lb. boxes, per lb.:

In.	3/16	¼	5/16	⅜	½	⅝	¾	⅞	1
	18c	16c	15c	13c	12c	11½c	11c	11c	11c

WEDGES.

Ax.....per doz. Nets
Galling.....per lb. "
Saw..... " 8½

WEANERS.

Calf.
Fuller's, per doz.....$2 00 to $2 50
Tyler's Safety, per doz. 1 85 to 2 40
Carroll's, per doz.... 3 00 to 3 75
Hoosier, per doz..... 3 50 to 4 60
Shaw Perfected..... 3 00 to 3 75

WEIGHTS.

Hitching.....per lb. Nets
Sash—f.o.b. Chicago
Ton lots, per ton.....$60 00
Smaller lots, per ton..... 63 00

WHEEL BARROWS.

No. 4 Tubular Steel..... @ $7 25
Common Tray or Stave Tray @ 2 75
Angle leg, garden..... @ 4 75

WHEELS.

Carborundum.....50%
Emery.....60%
Well.

Ins.....	8	10	12
Per doz.....	$5 50	7 25	8 50

12 in. heavy hoisting, per doz. $25 00

WIRE.

Brass.
In coils.....Nets
In 1-lb. spools, new list.....Nets

Broom—Tinned.....Nets

Cable—Same price as Barbed Wire.

Copper.
In coils.....Nets
1-lb. spools, new list.....Nets

Fence—Smooth. An'eal'd Galv'd
Nos. 6 to 9, less than car, per 100 lbs....$4 25 $4 95

Hair—New List.....40&10%

Market.	Market Quotations
Bright, full bdles.....	"
Bright, broken bdles.....	"
Coppered, full bdles.....	"
Coppered, broken bdles.....	"
Tinned, full bdles.....	"
Tinned, broken bdles.....	"

Picture—In coils.....80%@80&10%
In 5-lb. spools.....per lb.....26c

WRENCHES.

Coes Steel Handle, 6 inch.....	30%
" " " 8 "	30%
" " " 10 "	30%
" " " 12 "	30%
Coes Knife-Handle, 6 "	30%
" " " 8 "	30%
" " " 10 "	30%
" " " 12 "	30%
Coes All Patterns.....	30%
Bemis & Call's:	
Adjustable S, 10%; Adjustable S Pipe, 10%; Briggs' Pattern, 25%	
Combination Bright.....10%	
Steel Handle Nut.....25%	
Combination B'ack.....25&5%	
Merrick Pattern.....25&5%	

Knife Handle Pattern.
No. 62, Screw Wrench. List, plus 5%
No. 60, Steel Handle.

WRINGERS.

No. 790, Guarantee....per doz.		$67 00
No. 770, Bicycle.....	"	62 50
No. 110, Domestic....	"	55 50
No. 110, Brighton.....	"	51 00
No. 740, Bicycle.....	"	62 50
No. 22, Domestic....	"	55 50
No. 22, Pioneer.....	"	51 00
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